A CHILTON PUBLICATION

the Iron Age

THE NATIONAL METALWORKING WEEKLY

February 18, 1954

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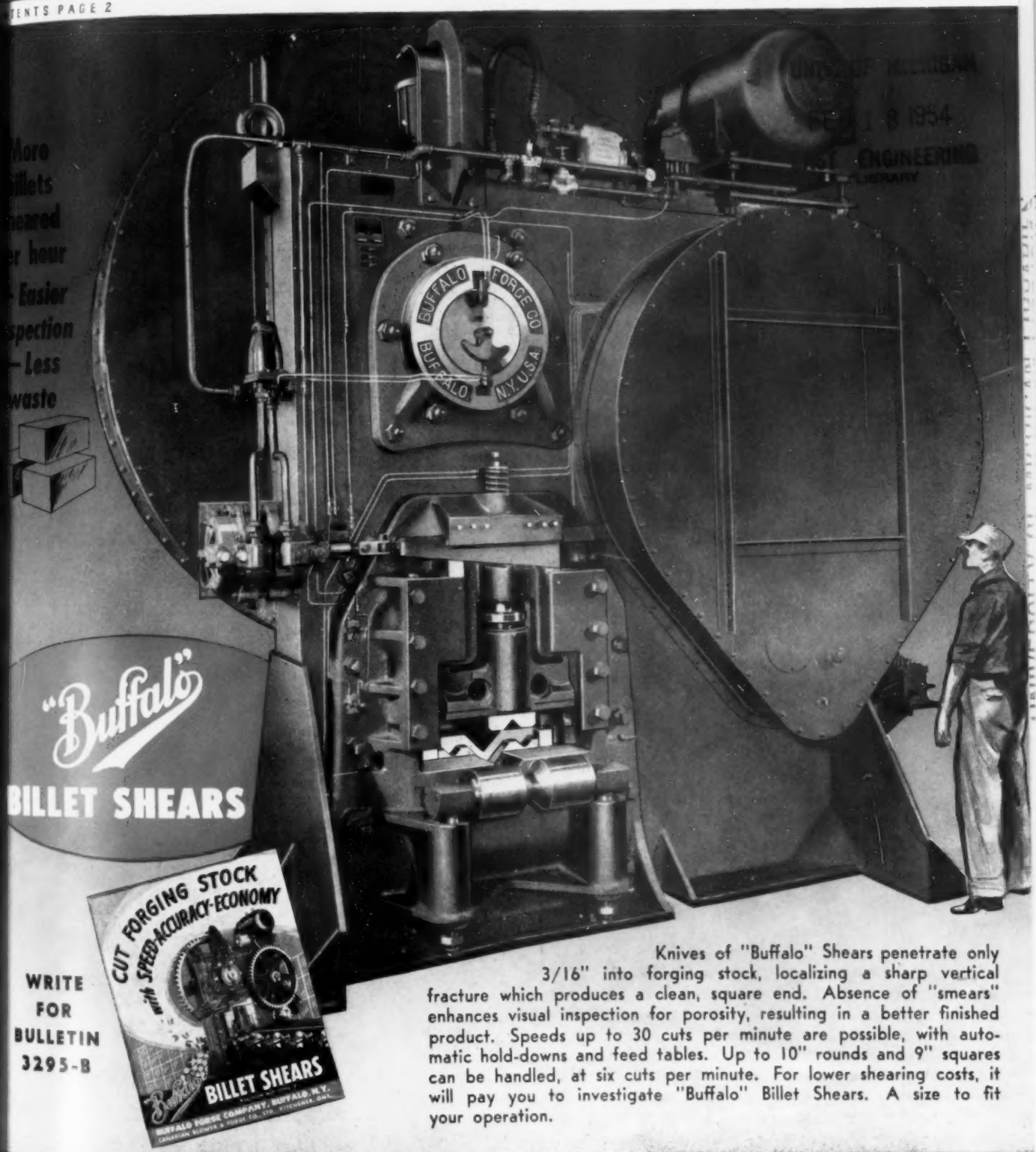
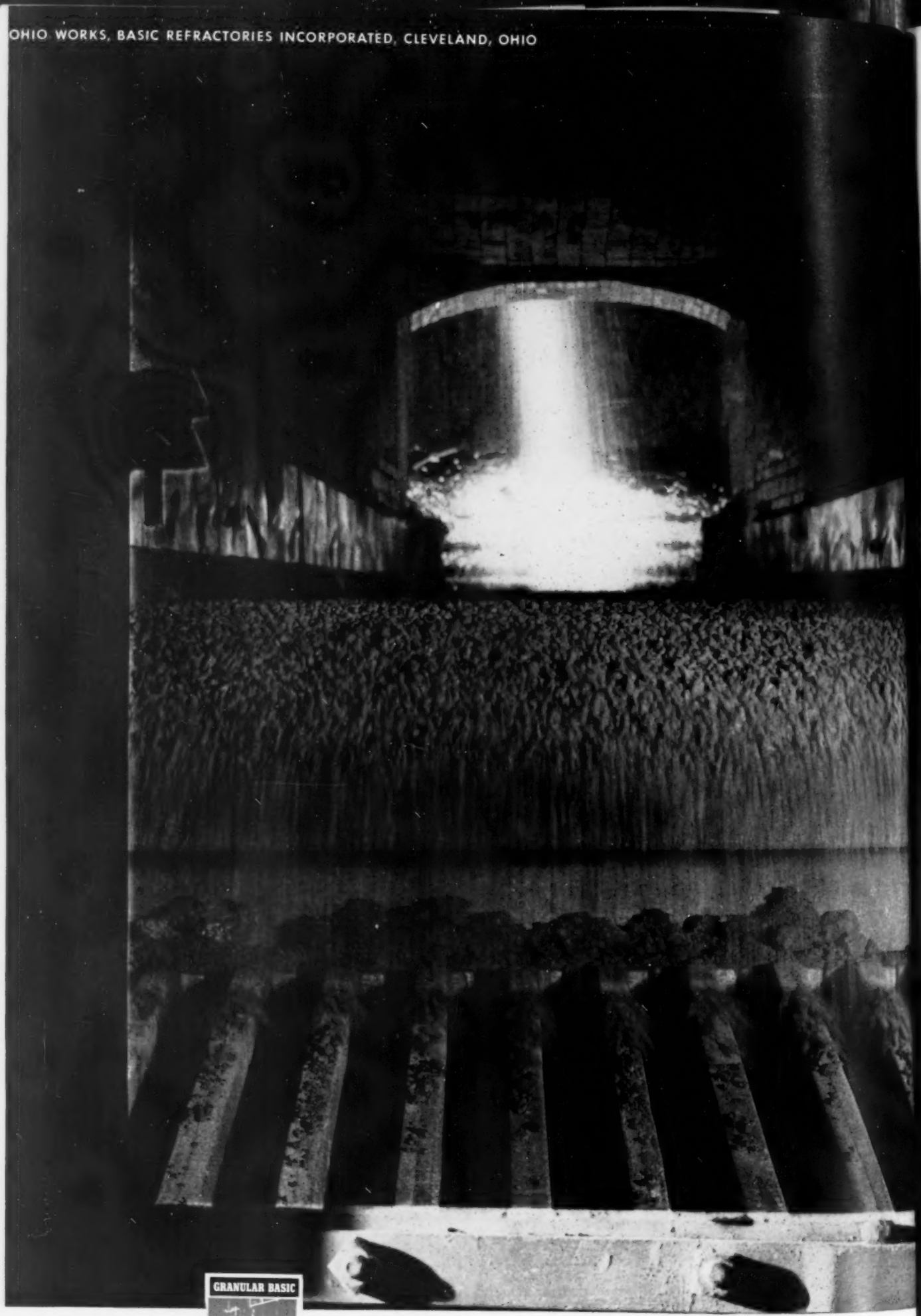


WRITE FOR BULLETIN 3295-B

Knives of "Buffalo" Shears penetrate only 3/16" into forging stock, localizing a sharp vertical fracture which produces a clean, square end. Absence of "smears" enhances visual inspection for porosity, resulting in a better finished product. Speeds up to 30 cuts per minute are possible, with automatic hold-downs and feed tables. Up to 10" rounds and 9" squares can be handled, at six cuts per minute. For lower shearing costs, it will pay you to investigate "Buffalo" Billet Shears. A size to fit your operation.

BUFFALO FORGE COMPANY, BUFFALO, N.Y.

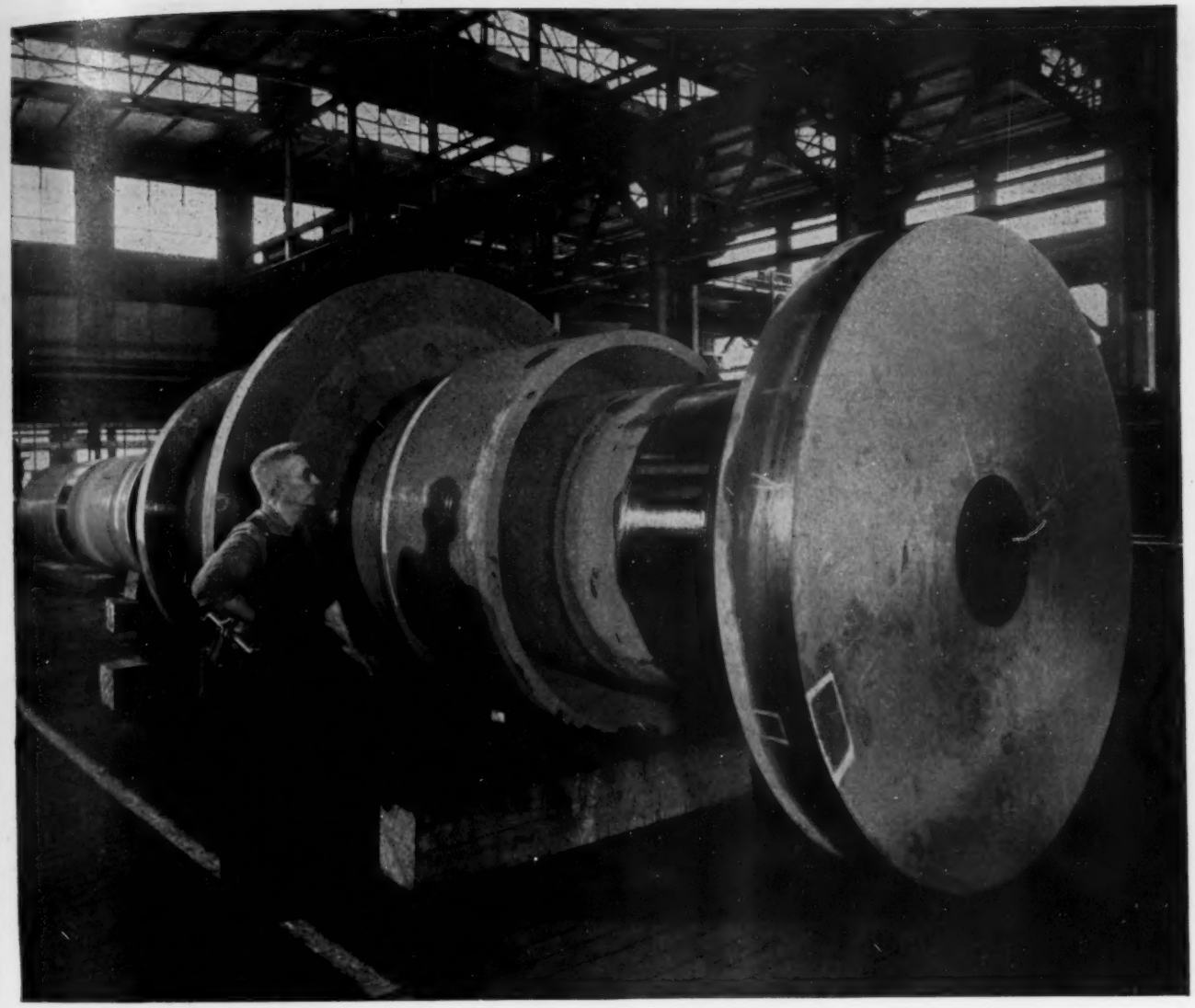
CANADIAN BLOWER & FORGE CO., LTD., KITCHENER, ONT.



GRANULAR BASIC

REFRACTORIES

"A good workman is known by his tools"



HUGE SHAFT TO BE PART OF HYDROELECTRIC PLANT AT McNARY DAM

This is a 96-ton water-wheel generating shaft that will see service in the hydroelectric plant of the big McNary Dam across the Columbia River. The shaft is one of a group being forged and machined by Bethlehem for this great power and flood-control project.

Bethlehem has made some heavier shafts, but few that were any more complex. As the picture shows, it is a tapered job, with the shaft proper ranging in outside diameter from 30 to 36 in. The large bearing flange near the center is 94 in. in diameter.

From an overall standpoint, the forging is a good example of the heavyweights our shops so often handle. But we also make some midgets—pieces weighing as little as an ounce. You can call upon Bethlehem for all kinds of forgings—closed-die, hammer, and press—and you will find them well made, the kind that consistently stand up in heavy-duty service.

We are always glad to talk forgings . . . so why not give us a ring the next time you're in the market? Remember, we make the full range, from drop forgings on up, and we can machine to your specifications.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

the Iron Age

DIGEST of t

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★Starred items are digested at the right.

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NEWS DEVELOPMENTS

STEEL TAKES BROADER LOOK AT IRON ORE — P. 73
Recent delivery of the first shipload of Cerro Bolivar (Venezuela) ore to Fairless Works and favorable Senate vote on the St. Lawrence Seaway have steel men talking about this country's ore future again. Future supplies will come from regular domestic sources, taconite, foreign mines.

WOULD TIE GAW TO UNEMPLOYMENT BENEFITS—P. 75
United Steelworkers of America has proposed hitching the guaranteed annual wage to unemployment compensation. Plan is the same as one rejected by Aluminum Co. of America last year. USW example shows worker getting 63 pct of his normal earnings—which he could collect for 52 weeks.

SOLVE MANAGEMENT PROBLEMS ON PAPER — P. 76
Operations Research has provided the clue for a number of unexpected savings and higher efficiencies. How? It's a method of scientific management designed to analyze almost any operation thoroughly. Solutions are mathematical, often complex—but results have been startling in many cases.

METALS AND POWER SPUR SPOKANE GROWTH—P. 80
In the 150,000-square-mile area between the Cascade and Rocky Mountains centered around Spokane, aluminum and low-cost federal power have fathered a thriving industrial growth. Population rose 32.5 pct in 10 years between 1940 and 1950. Only problem is that industrial growth may outstrip power supply.

MODERN BLUE LAWS CHAFE AUTOMAKERS — P. 94
Among the major problems of the auto industry are the thousands of state laws that affect the manufacture of automobiles. During 1953 an estimated 17,000 bills were introduced in 44 states affecting some phase. Not all are bad, but many are ill-advised, conflicting, or not in best public interest.

WILSON BUDGET GETS TWO-PARTY SALUTE — P. 99
There'll be a minimum of haggling over the fiscal 1955 military budget—congressmen of both parties are just about convinced that it's "tight." Being able to count on strong bipartisan support on defense and procurement matters is a position the White House has built slowly over the last year.

the Week in Metalworking

ENGINEERING & PRODUCTION

LOW-COST ALLOYS: GOOD HEAT RESISTANCE—P. 137
You can save money by getting better acquainted with the physical, chemical and metallurgical properties of wrought heat resistant alloys. Included in this group are types 330, 310, 309, 430, and 446. By proper selection they compete with harder-to-get materials in meeting tough service requirements.

WATCH FURNACE VACUUM SYSTEMS CLOSELY—P. 142
Selection of proper pumping system and components is of major importance in high vacuum melting. Equally important is placement of components in the system. For operating in the general pressure range, an oil-vapor ejector supported by a mechanical forepump is favored. Gasketing requires great care.

HOW 18-8 ELECTRICAL PROPERTIES CHANGE—P. 146
Percentage of cold reduction, and heat treating temperatures can make a marked change in the electrical properties of 18-8 stainless steel wire. Basic to these changes is the conversion of paramagnetic austenite to ferromagnetic martensite. Both remanence and coercive force were measured in these studies.

HARD CHROME PLATING SETUP MECHANIZED—P. 150
A mechanized hard chrome plating setup has brought speed, efficiency and top quality to the plating of cotton picker spindles at one plant. The parts, made from C1117 steel, need the hard plate to resist wear from cotton strands. Only one operator is required for the unit, which is run round-the-clock.

NEXT WEEK—WHAT'S NEW IN INDUSTRIAL FURNACES
Furnaces have gone modern in a big way. Mechanization, automatic operation, scientific control, modern engineering are saving manpower, time and fuel. Now a single piece of equipment does in one continuous operation what several separate units used to do. New controlled atmospheres and salt baths cut metal losses.

To aid you in your drive for lower production costs, and as a yardstick in measuring efficiency in your own plant, scores of case studies on modern furnace operation have been brought together. Here, in one handbook, are the methods others are using to cut costs, save manpower, and make a better product.

MARKETS & PRICES

THERE'S MORE THAN ENOUGH TITANIUM—NOW—P. 83
Supply of titanium tops demand as new sponge capacity developed faster than expected. But the condition is strictly temporary as some see an eventual need of 150,000 tons annually by the military alone. Expansion goals are being boosted but there's still no replacement for the expensive Kroll process.

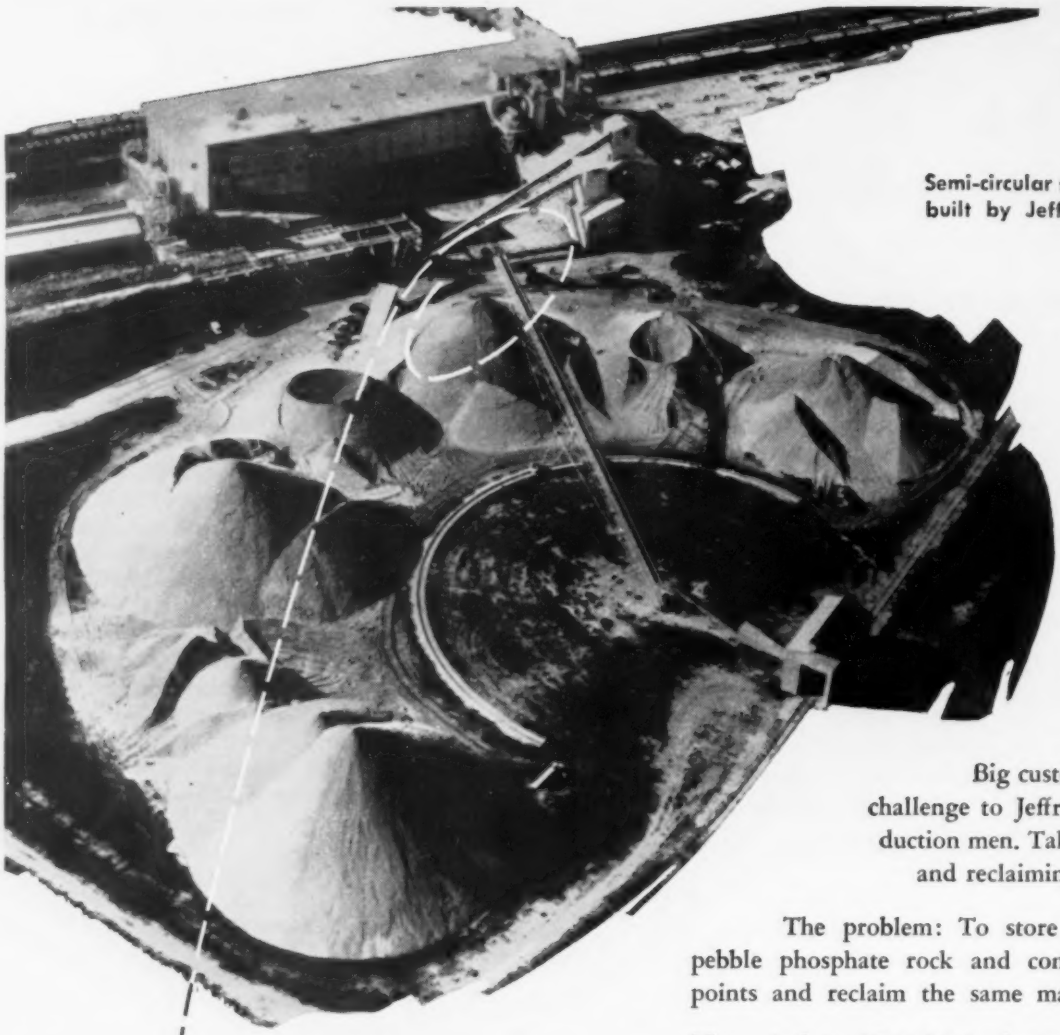
MAGNESIUM PACE SLOWER, NOW STEADIER — P. 85
Foundrymen in the magnesium business feared defense stretchouts would bring a repetition of the knockout blow they got after World War II. But, now that inventories are better adjusted to the reduced pace, they find that the cut isn't black doom. Civilian markets are salesmen's prime target.

TOOL BUILDERS FEAR GERMANY'S STRENGTH—P. 105
West German machine tool industry, heavily financed since World War II by U. S. dollars, has grown at a surprising rate. American builders estimate it is twice as large as their own industry and employs twice as many people. Some U. S. builders want higher tariffs, limit on use of U. S. financial aid.

WHAT'S BEHIND THE CURRENT BUSINESS DIP—P. 107
Main cause of the current "rolling readjustment" is inventory cutbacks. Industry, business are adjusting to easing supplies, quicker deliveries, gentle emergence of a buyers' market that began last fall. This trend cannot continue indefinitely. Latest Dept. of Commerce figures show $2.5 billion drop in inventories.

STEEL OPERATIONS TO HOLD IN MID-SEVENTIES—P. 175
Steelmaking operations continue to move solidly in the mid-seventies. And there's nothing in sight that is expected to change the rate of production more than a few points. The formerly robust market in Detroit has turned rather bleak, but other areas show a little more strength. Result: A more steady market.

COPPER DELIVERIES PLUNGED IN JANUARY — P. 178
Deliveries of refined copper to domestic fabricators totaled only 77,091 tons in January. This compares with 112,244 tons in December and a 1953 monthly average of 120,310 tons. At the rate sales are now going, February will see a pickup to about 85,000 to 90,000 tons, but output will dip.



Semi-circular storage piles built by Jeffrey Stacker.

from top to bottom ... it's JEFFREY

Big custom jobs are a constant challenge to Jeffrey engineers and production men. Take this modern storage and reclaiming system for instance:

The problem: To store 1" dia. and smaller pebble phosphate rock and concentrates at different points and reclaim the same material for processing.

The solution: Material is dumped from railroad cars into track hoppers over two Jeffrey-Traylor feeders . . . moves on Jeffrey Belt Conveyor — at 800 T.P.H. — to track-mounted Jeffrey Stacker which turns on a 270′ radius to build 80-foot-high semi-circular piles of approximately 320,000-ton capacity. A series of valves beneath the piles discharge onto a traveling hopper which feeds two Reclaiming Belts at 336 T.P.H. each for processing. Rock can be removed at controlled rate from any point in pile or several points at once.

The entire installation is built to withstand hurricane winds . . . to operate efficiently at low cost . . . to meet the rigid engineering standards of Jeffrey and its client. Write for Catalog 852.

Jeffrey Belt Conveyors in tunnels under piles reclaim materials to process.

THE JEFFREY MANUFACTURING CO.

ESTABLISHED 1877

Columbus 16, Ohio

sales offices and distributors in principal cities

PLANTS IN CANADA, ENGLAND, SOUTH AFRICA

IF IT'S MINED, PROCESSED OR MOVED
. . .IT'S A JOB FOR JEFFREY!

THE IRON AGE

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Utopia Unlimited

EACH day brings converts to a new way of life. The formula is that things will go ever upward; that all of us will get more and more for less and less work. This view is held by highbrows, lowbrows, high lowbrows, super highbrows and just plain everyday brows.

We have been in lamb chop and steak heaven for quite a spell. Physical poverty as we used to know it has practically disappeared. Unemployment is unbelievably low for a country which has 61 million workers.

The slogan is full employment at higher and higher rates of pay. This will increase purchasing power. Along with this will go lower taxes with no change in government services.

We must have old age security with large benefits but with no actuarial basis for the build-up. When we retire at 65 we will come closer and closer to our working day pay. Those still working will support these pension payments.

Some of our more enthusiastic supporters of gracious living (with the least effort possible) would provide homes for all brides—with a slight down payment and endless but painless (?) monthly payments. We are to have not one but all the comforts of the genteel life at an early age. No waiting around while we build savings.

We must carry on this new way of life because we have to avoid a ——— (shh, you know what) at any cost. If thrift must go let it go. If being in debt helps the thing along let's pat the shoulder of the fellow who has the biggest debt.

Most of us wish that everyone could enjoy Utopia Unlimited. There are good human reasons why we do. Those who grow older don't want to live with their children—or go to the poor house.

Veterans of World War II and the Korean War believe they have to make up for lost time. They feel strongly that opportunity passed them by. They have no time to waste and they want things to go upward and onward. Why not? Wouldn't you?

Those who started working in the 30's want their chance to make a bundle. They feel they had a setback which was not their fault.

There are those who were born in the 30's and want to know what all the shouting is about. They have seen the new system in action. They like it. They want their place in the sun too.

There is only one thing wrong with Utopia Unlimited. It would take a miracle to make it work; you can't get something for nothing!

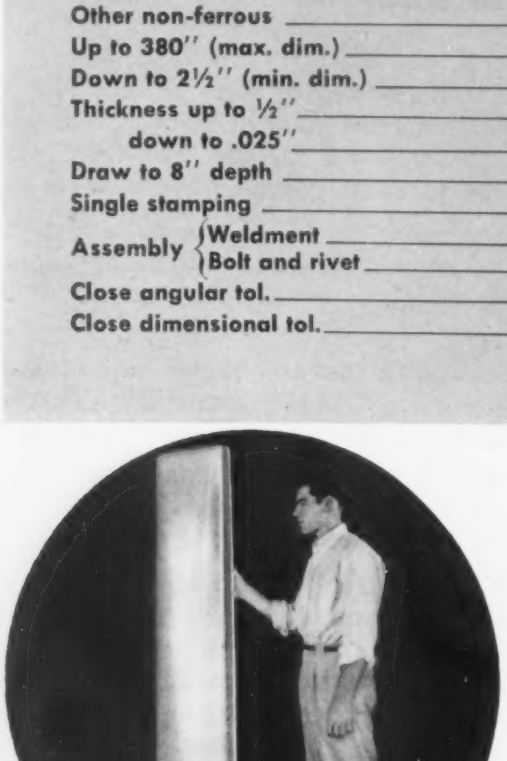
Tom Campbell

Editor

High Alloy Steel _____
Mild Steel _____
Heat treated for { Hardness _____ / Toughness _____ / Combination _____
Aluminum _____
Aluminum Alloy _____
Other non-ferrous _____
Up to 380" (max. dim.) _____
Down to 2½" (min. dim.) _____
Thickness up to ½" _____
down to .025" _____
Draw to 8" depth _____
Single stamping _____
Assembly { Weldment _____ / Bolt and rivet _____
Close angular tol. _____
Close dimensional tol. _____

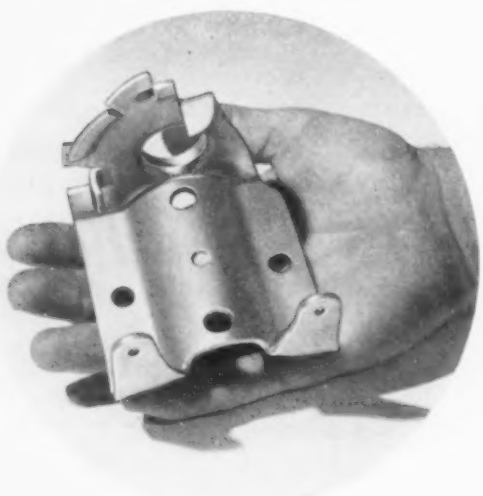
Check your parts requirements here

then call . . .



In finished form, the Reflector Hood for Street Lighting installation (above) is 76" long, 13¾" wide, 6¼" deep, drawn in one piece from .0598" Aluminum sheet.

The part below, in contrast is only 3⅛" long x 3⅛" max. high, blanked, perforated, off-set and formed in a complex shape from .120" mild steel. It is an automatic Transmission Control Shaft Support.



PARISH for production!

You can profit by calling Parish for production of pressed metal parts for many reasons. One is the wide variety of parts in many sizes, all analyses we can produce and deliver in quantity, as indicated by the check list above and the pictures at the left. But this is only a part of the story. In addition to top-flight production capacity and ability, you get design-research-engineering assistance that will help you to time- and money-saving solutions to many production problems; and may suggest ways to actually improve products by substitution of lower-cost stampings for castings and forgings.

Why not give it a try. Send us a print or sketch-drawing of a present part, or in-work project, and ask us to help. We'll be glad to—you won't be obligated. Write:

PARISH SUBSIDIARY OF DANA CORPORATION
PRESSED STEEL COMPANY, READING, PA.

Western Representative:
F. SOMERS PETERSON COMPANY
524 Folsom Street, San Francisco, Cal.
413 East 12th Street, Los Angeles, Cal.

PARISH pressed metal parts for better products

Dear Editor:

Letters from readers

Sorting Mixed Metals

Sir:

We are constantly watching your magazine for information on new developments because that is where we find them first in print. In THE IRON AGE Newsfront for Feb. 4 we notice "a newly developed instrument promises to take many of the headaches out of the old problem of sorting mixed metals in warehouses."

Can you tell us who makes this instrument? We would like also to know the principles on which it operates and the range and selectivity which it gives.

H. L. SITTLER
Metallurgist

Arcrods Corp.
Sparrows Point, Md.

A detailed article on this new instrument will appear in our Mar. 4 issue.—Ed.

Hot Extrusion

Sir:

In your Jan. 21 issue the article on p. 43 covering heat extrusion by the modified Ugine-Sejournet process has come to our attention. You refer to a Scaife Development Co.

Would it be possible for you to give us the address of this organization so we may contact them for further information with reference to this process?

F. J. TKACH
Purchasing Agent

Vlchek Tool Co.
Cleveland

The address is 126 Ann St., Oakmont, Pa.—Ed.

In Demand

Sir:

The articles entitled: "High Purity Chromium Key to Better Alloys" and "Multipass Welding Increases Ductility" appeared in your Jan. 21 issue. "Inert-Gas Welding Cuts Cost of SAE 1020 Dolly Wheels" appeared in the Jan. 28 issue.

Because of their interest, we would very much appreciate your permission to reprint for distribution to our members only. Proper credit would be given.

J. R. DERRICKSON
Executive Secretary

Formed Steel Tube Institute.
Cleveland

Steel Production Index

Sir:

Some time ago we read with interest of your new index of steel production based on 1947 through 1949 as the base. I have glanced quickly through several recent copies of your magazine without finding any information on this subject. Therefore, I assume that this is available only as part of your weekly news release on steel production. Inasmuch as we are interested in following this new index, would it be possible for you to put us on your mailing list for your weekly news release?

I would also appreciate having any background information on this index which is readily available.

R. F. LITTLEHALE, JR.

National Shawmut Bank of Boston
Boston

This index is carried on our Steel Outlook page each week. If you desire to pick up the total series so far we suggest you write to the American Iron and Steel Institute, 350 Fifth Ave., New York.—Ed.

Lofting

Sir:

The Technical Brief entitled "Lofting," which appeared on p. 148 of your July 9, 1953 issue, has come to the notice of our shipyard engineers at Whyalla, South Australia and I should be grateful for any further information that you may care to let me have regarding the practice described.

It is noted that the first step in this method is to prepare a template drawing on dimensionally stable paper. Could you advise me as to the name and address of the manufacturer of this paper or whether one of the common types of drawing papers can be treated to render it dimensionally stable.

I. H. CARNE
American Representative

Broken Hill Proprietary Co., Ltd.
New York

The Ampower Corp., 50 Broad St., New York 4, N. Y. will be able to give you further details on this method.—Ed.

Stress Patterns

Sir:

Would you please be kind enough to send the writer tear sheets of Parts I, II, and III of the article "How to Develop Favorable Stress Patterns," which appeared in your Nov. 12, 26 and Dec. 17 issues?

R. E. MAHR
Supervisor
Materials Laboratory

Chrysler Corp.
Detroit

Plastic Pipe

Sir:

I should like to have a reprint of the article "Plastic Pipe: Steel Firms Join In," by J. B. Delaney which appeared on p. 38 of your Jan. 21 issue.

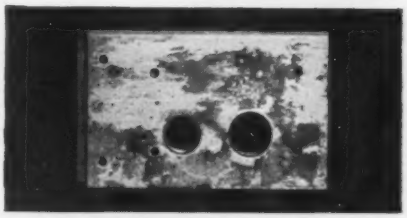
DAVID KNOX
Application Engineer

Industrial Nucleonics Corp.
Columbus, Ohio

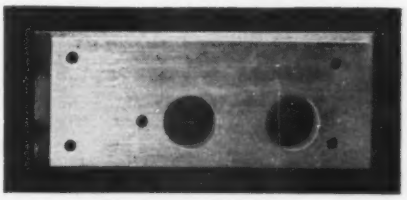
How Diebold, Inc.

keeps their

SAFES SAFE from rust



This part from a Diebold safe door was covered with fingerprint neutralizer, then spotted with synthetic perspiration. In a matter of days destructive rust was apparent.



This Diebold safe door part was spotted with synthetic perspiration, covered with fingerprint neutralizer, then wrapped with Marvellum VPI. At the end of the test there was no indication of rust. The part was in the same excellent condition as the day it was made.

with MARVELLUM VPI® WRAP

No wonder, after the tests shown above, Diebold Inc. chose Marvellum VPI® Wrap to protect their safes from rust. All ferrous metal parts are now kept wrapped from the moment they are made and each safe . . . large or small . . . is protected by Marvellum VPI before and during shipment. A special coating on the VPI paper vaporizes . . . forms an invisible protective film that positively prevents rust.

Marvellum VPI is easy to use . . . just fold the paper over the part. No need for time-consuming slushing or greasing. No mess or costly cleaning when the item is unwrapped. It's bright and clean, ready for immediate use.

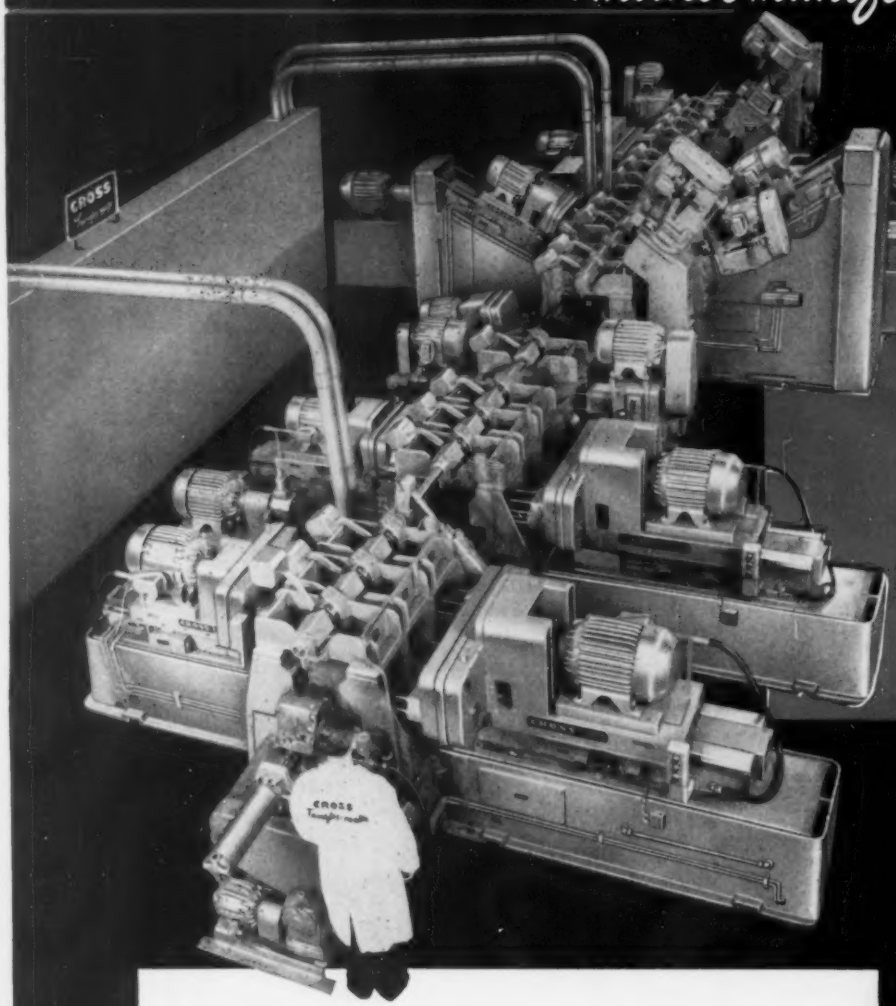
You'll find many uses for Marvellum VPI in your plant . . . wrap steel parts, protect inventories, line tote boxes.

Marvellum VPI is available in rolls of 20, 30, 40 and 60 lb. paper stock and *can be individually imprinted with your trademark* on quantity orders. Envelopes, sheets, bags, shrouds and tubes are also available.

FREE BOOKLET
Gives you all the facts.
Send for your copy today.

The Marvellum Company
2 Appleton Street **Holyoke, Mass.**

Another Transfer-matic by Cross



Drills, Reams and Taps Automatic Transmission Housings

★ 29 stations.

★ 78 operations—30 drilling, 12 chamfering, 4 end milling, 3 counterboring, 14 reaming, 15 tapping.

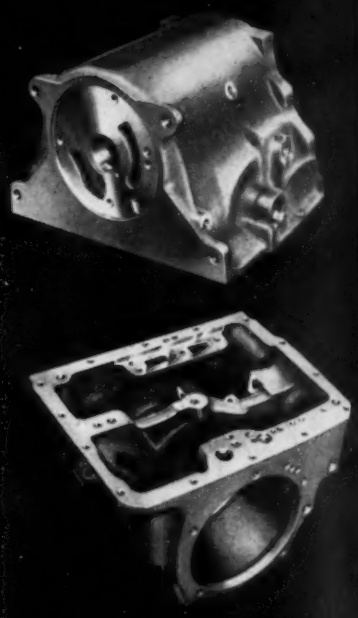
★ 100 pieces per hour at 100% efficiency.

★ Automatic 90° indexing of part in station 14 for drilling sides and top in subsequent stations.

★ Pre-set tools and Cross Machine Control Unit with Toolometers for programming tool changes.

★ Complete interchangeability of all standard and special parts for easy maintenance.

★ Other features: Automatic transfer from station to station; hydraulic feed and rapid traverse; individual lead screw feed for tapping; hardened and ground ways; gravity operated cam clamping; J.I.C. standard construction; built-in chip conveyor.



Established 1898

THE CROSS CO.

DETROIT 7, MICHIGAN

Special MACHINE TOOLS

Fatigue Cracks

by William M. Coffey

Relieved

This is the only day since we joined up that the entire brass is away from the office. Just so happens that everybody — editorial brass, sales brass, research brass, production brass—has pulled out and left us all alone. This, of course, leaves us for the moment as top dog. Naturally, in our new role as top dog we can issue orders. We can assume this authority under AR 30-78965, Sec. D, Par. 254a, covering chain of command. So, having assumed the topdogship, we hereby issue the following general order:

By authority of AR 30-78965, Sec. D, Par. 254a the following chap is hereby relieved of writing Fatigue Cracks—and is ordered to Florida for a long undeserved rest.

William M. Coffey

—and we want everybody to know that if everybody ever goes away again and leaves us all alone again, we're not just going to stop there.

We've been greatly concerned lately about the lack of humility shown around here.

Get 'Em Young

We believe in starting newly born people off right in this world. So we're printing the following announcement so that Lisa Jill can tell all her friends that she hit THE IRON AGE, The National Metalworking Weekly, number one in the world.

Presenting A New Alloy

Name: LISA JILL
Major Constituents: Shirley Taussig and Leonard Taussig
Density: 6 lbs, ½ ounce

The new alloy was presented to the world on January 29, 1954 with the cooperation of the Edgewater Hospital laboratories. The alloy is definitely of the precious type and was cast in a one-of-a-kind mold. The alloy is quite malleable and soft, has a high lustre and exhibits a tinge of dark fibers on its upper section.

The labor cost was amortized over a nine month period and future foreseeable assets are definitely of the liquid type.

As Circulation Manager of THE IRON AGE, The National Metalworking Weekly, number one in the world, we're always on the *qui vive* (fr.) for new subscribers. Never miss a trick. Just send eight bucks, Lisa Jill, giving us your position and your company affiliation. L. J.'s father is the Metallurgist for Magnaflux Corp., Chicago.

New Books

The U. S. Government has published two new books. Look like best sellers. One is entitled *The Boy Behind the Pins, Report on Pinsetters in Bowling Alleys.* "Material for this report was secured from observations in bowling alleys . . ." The other is entitled *Ways To Cook Rabbit.* Material for this report was obtained from observing people who cook rabbits.

Puzzlers

We've fallen a little behind in our puzzler section, so herewith are the answers to two puzzlers and the winners. Pirate's water puzzler —fill pitcher from pail, empty pitcher into bucket, fill pitcher from pail again, fill bucket from pitcher, empty bucket into pail, pour 1 qt from pitcher into bucket, fill pitcher from pail, empty pitcher into bucket. And you end up with 4 qts each. Winners: Donald Stoneburner, Miss Mildred Kisser, E. B. Snow, Everet L. Mason, Patty Brugger, Ted Melnechuk, Norman H. Ferguson, J. H. Eichenberger, Harry Rupp, Stanley W. Colbert, John Cluck, J. J. Brugman, George Langton, Jr., Stanley A. Orr, Richard Van Den Berg, Robert W. Ruoff, C. A. Ward, G. W. Alsterlund (whose poems we greatly admire), Carol Snavely, Edward W. Weiler, George Benoit, Frank Worack and Mr. Rice.

Second puzzler, the one about uphill and down from Cortland to Binghamton—road on the level 11 miles, road uphill 20 miles, road downhill 11 miles. Winners: Mark Perucich, G. W. Alsterlund, J. R. Scott, Stanley A. Orr, Joan Leslie Ehrlich, John Cluck, G. D. Rahrer, Wm. E. McCord, Steven Charnota, J. J. Brugman, Steve Schemine, L. G. Bayrer and Mr. Rice.

New Puzzler

Here's one submitted by Stanley Orr: Every day a street peddler sold 30 neckties at 3 for $1. A competitor a block down the street sold the same quantity at 2 for $1. One day the first peddler became ill. He turned his stock over to the second peddler to be sold. Not wishing to sell half at one price and half at another, the second peddler made the following calculation:

30 @ 3 for $1 = $10
30 @ 2 for $1 = $15
— — —
Average 60 @ 5 for $2

When the day was over he found he had taken in only $24. Where did the extra dollar go?

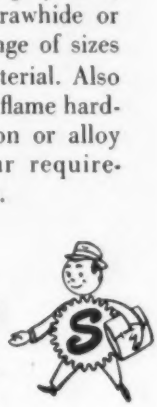
SIMONDS

INDUSTRIAL CUT GEARS

LARGE OR SMALL
HEAT TREATED OR PLAIN

SIMONDS has over 60 years' experience in cutting quality industrial gears. We can supply any type of gear in cast or forged steel, gray iron, bronze, Meehanite, rawhide or bakelite in a full range of sizes adaptable to the material. Also heat-treated, case or flame hardened gears of carbon or alloy steel. Send us your requirements for quotation.

Custom
GEAR CUTTING



SIMONDS' facilities can produce any type of custom gear from your blanks if you prefer. Same quality . . . same prompt service.

QUALITY GEARS FOR OVER 60 YEARS

SPUR GEARS
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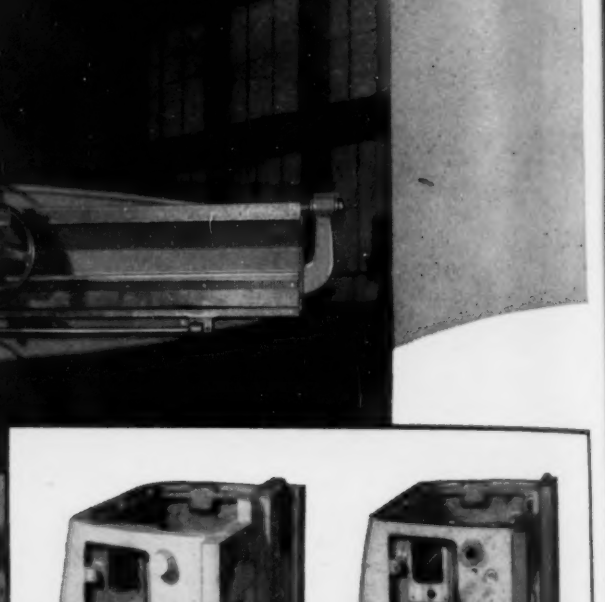
Also stock carrying distributors of Ramsey Silent Chain Drives and Couplings; and industrial V-belts.

SIMONDS GEARS

THE SIMONDS GEAR & MFG. CO.
LIBERTY at 25TH PITTSBURGH 22, PA.

Bickford accuracy



Milling Machine Knee

Photos courtesy of the George Gorton Machine Company, Racine, Michigan

. . . HELPS BUILD ACCURATE MACHINE TOOLS

To .0005″ accuracy, this performance in drilling, reaming and boring 100 holes from ½″ to 2½″ diameter to 3″ deep, to this tolerance, is typical of Cincinnati Super Service Radial Drills.

Here at the George Gorton Machine Company, manufacturers of machine tools, where accuracy is necessary, ten Cincinnati Bickford machines are in use.

Write for Catalog R-29.

CINCINNATI BICKFORD

SUPER SERVICE RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio, U.S.A.

Dates to Remember

Meetings

MARCH

STEEL KITCHEN CABINET MANUFACTURERS ASSN.—Mar. 3, New York City. Association headquarters are at 1008 Engineers Bldg., Cleveland.

AMERICAN SOCIETY FOR METALS—Midwinter meeting, Mar. 4-5, Statler Hotel, Boston. Society headquarters are at 7301 Euclid Ave., Cleveland.

AMERICAN GAS ASSN. — Transmission and storage conference, Mar. 4-5, Jung Hotel, New Orleans. Association headquarters are at 420 Lexington Ave., New York.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS—National meeting, Mar. 7-10, Statler Hotel, Washington, D. C. Institute headquarters are at 120 E. 41st St., New York.

NATIONAL ELECTRICAL MANUFACTURERS ASSN.—Mar. 7-11, Edgewater Beach Hotel, Chicago. Association headquarters are at 155 E. 44th St., New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS — Internations meeting, Mar. 10-12, Hotel Del Prado, Mexico City. Headquarters are at 29 West 39th St., New York.

NATIONAL ASSN. OF WASTE MATERIAL DEALERS, INC.—Annual Convention, Mar. 15-17, Waldorf-Astoria, Hotel, New York. Association headquarters are at 271 Madison Ave., New York.

NATIONAL ASSN. OF CORROSION ENGINEERS—Annual meeting, Mar. 15-19, Municipal Auditorium, Kansas City. Association headquarters are at 1061 M & M Bldg., Houston.

STEEL FOUNDERS' SOCIETY OF AMERICA—Annual meeting, Mar. 16-17, Edgewater Beach Hotel, Chicago. Society headquarters are at 920 Midland Bldg., Cleveland.

STEEL SHIPPING CONTAINER INSTITUTE, INC.—Annual meeting, Mar. 23-25, Biltmore Hotel, Palm Beach, Fla. Institute headquarters are at 600 Fifth Ave., New York.

RAIL STEEL BAR ASSN.—Annual meeting, Mar. 24-26, Jung Hotel, New Orleans. Association headquarters are at 38 S. Dearborn St., Chicago.

AMERICAN HOT DIP GALVANIZERS ASSN. — Annual meeting, Mar. 25-26, Netherland Plaza Hotel, Cincinnati. Association headquarters are at 1506 First National Bank Bldg., Pittsburgh.

AIR-CONDITIONING & REFRIGERATION INSTITUTE — Annual meeting, Mar. 30-Apr. 2, The Greenbrier, White Sulphur Springs, W. Va. Institute headquarters are at 1346 Connecticut Ave., N. W., Washington, D. C.

APRIL

CUTTING DIE INSTITUTE — Semi-annual meeting, Apr. 1-2, T. Roosevelt Hotel, New Orleans. Institute headquarters are at 1643 National Bank Bldg., Detroit.

AMERICAN INSTITUTE OF MINING & METALLURGICAL ENGINEERS — Iron & Steel Div., Annual meeting, Apr. 5-7, Palmer House, Chicago. Institute headquarters are at 29 W. 39th St., New York.

METAL TREATING INSTITUTE — Spring meeting, Apr. 5-7, The Homestead, Hot Springs, Va. Institute headquarters are at 271 North Ave., New Rochelle, New York.

AMERICAN SOCIETY OF LUBRICATION ENGINEERS — Annual meeting and exhibit, Apr. 5-7, Netherland Plaza Hotel, Cincinnati. Society headquarters are at 343 S. Dearborn St., Chicago.

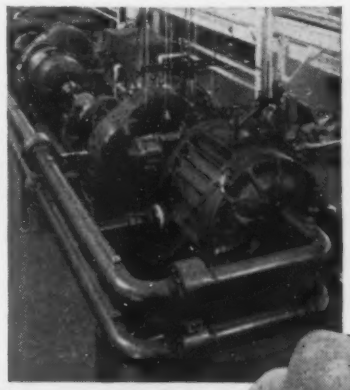
EDISON ELECTRIC INSTITUTE—Sales Conference, Apr. 5-8, Edgewater Beach Hotel, Chicago. Institute headquarters are at 420 Lexington Ave., New York.

CUTTING TOOL MANUFACTURERS ASSN.—Spring meeting, Apr. 6. Association headquarters are at 416 Penobscot Bldg., Detroit.

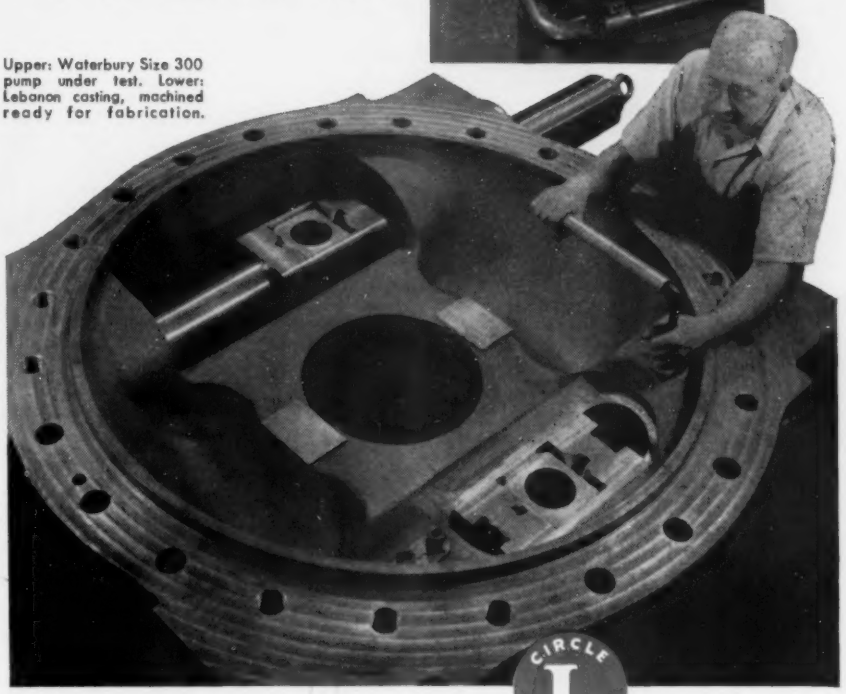
in the

World's Largest

oil hydraulic pumps



Upper: Waterbury Size 300 pump under test. Lower: Lebanon casting, machined ready for fabrication.



CIRCLE L

LEBANON STEEL Castings

are at work...

IN WATERBURY TOOL'S SIZE 300 PUMPS—largest oil hydraulic high-pressure pumps ever built—dependable Lebanon CIRCLE (L) castings help confine the tremendous forces developed. These pumps are the working heart of the world's largest tube reducing machine being built by E. W. Bliss Company for Tube Reducing Corporation. On the tube reducer these pumps will move the equivalent of three fully loaded freight cars three feet forward and three feet backward—every two seconds! Each pump weighs 21½ tons, is capable of delivering 2300 gallons per minute at pressures up to 3000 p.s.i. and can transmit up to 4000 H.P.

Lebanon steel castings in the pumps for this extraordinary machine that cold rolls tubing up to 18" O.D., were engineered and built for enduring service.

● See—STEEL WITH A THOUSAND QUALITIES—37-min., 16 mm, semi-technical, full-color, sound film on the making of steel castings. For information write: Dept. A, Lebanon Steel Foundry.

LEBANON Castings

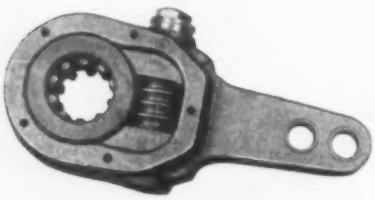
CARBON, SPECIAL ALLOY AND STAINLESS STEEL

CIRCLE L

LEBANON STEEL FOUNDRY LEBANON, PA.

5 THREADING PASSES ELIMINATED By LANDIS Centerless Thread Grinders

BENDIX - WESTINGHOUSE in Elyria, Ohio, recently installed two *LANDIS* #1 Centerless Thread Grinders for threading slack adjuster gear worms used in automotive air brakes. This new threading method resulted immediately in fewer threading operations, fewer rejects, savings in critical materials, and longer product life.



Gear worm blanks are made of alloy steel, heat-treated to a 285-311 Brinell hardness. Former methods had required 7 separate passes to complete the threads. Threads were rough-cut before heat-treating in one pass, then finish-ground in six passes after heat-treating.

Using the *LANDIS* Centerless Thread Grinders, threads are now completed after heat-treating in *two* operations. Both machines are arranged for "upgrinding", a method developed by *LANDIS*, which allows up to 30% greater work surface speeds while maintaining concentricity and finish. Upgrinding allows deeper cuts, and threads are finished in two passes. For example, on the machine producing 3½ pitch threads on 1¼" gear worms, roughing takes a .108" cut, finishing .089", with 8 pounds of metal removed every hour.

Other important advantages have resulted from the new process. By grinding threads after heat-treating, locked-in stresses are eliminated, and BENDIX-WESTINGHOUSE reports show that product life has been doubled. In addition, a reduction in the number of rejects and the elimination of a nubbing on the workpiece (formerly required to facilitate threading) has effected substantial savings of critical materials.

This successful production story can be retold in your plant. Centerless Thread Grinders, built exclusively in the United States by *LANDIS*, are designed for highspeed mass production of screw threads ranging from 1/16" to 4¾" in diameter. Please send specifications when writing for additional information.

LANDIS *Machine* COMPANY · WAYNESBORO PENNSYLVANIA

Steel Takes a Broader Look at Iron Ore

Future supplies will come from regular domestic sources, taconite beneficiation, and foreign mines . . . By 1970 present sources will account for less than half—By *R. M. Lorz.*

Recent delivery of the first boatload of Cerro Bolivar (Venezuela) ore to Fairless Works and favorable Senate vote on the St. Lawrence Seaway have steel men talking about this country's ore future again.

Interest in this country's ore future is of course concentrated in the Great Lakes area which boasts 80 pct of the nation's blast furnace capacity and produces at least 35 pct of all the steel made in the world.

Industry Needs Both

It is no secret that vast deposits of rich open pit Mesabi ores are being rapidly depleted. Guessing games start when a boat leaves South America with the first ore from a rich new development. As the great days of cheap Mesabi ore fade into legend problem of maintaining a delicate balance between cost and international risk rises to the surface.

If it is feasible steel men want to have an adequate supply of "backyard" ore to insulate themselves against international emergencies. Rich Canadian ores and low grade concentrates will definitely provide at least a partial answer. But serious estimates on expanding population and economy point to a need for foreign ore also.

What will this country's ore needs be in 25 to 30 years? Before considering projected figures it seems advisable to review segments of steelmaking history. In the years between the Civil War and the turn of the century steel production multiplied over 1000 times to reach production of 11.4 million net tons in 1900. During the hectic years of World War I and the prosperity days of the Twenties production more than quadrupled to 63.2 million. Since the stock market crash of '29, the greatest shooting war of all time and Korean fighting have spurred expansion of productive capacity to over 124 million annual tons of steel.

Expansion in steel has been breathtaking and it promises to continue. By 1980 some experts expect U. S. capacity to scale 150 million tons. To meet this expansion a minimum of 157 million tons of ore will probably have to be shipped. Many authorities think this estimate is low because hot metal yield is constantly on the rise and more light and alloy scrap is being generated. If 157 million tons turns out to be the minimum requirement, where will it come from?

Turn Page

What Iron Ore Producers See Ahead

Estimated Shipments—Thousands of Gross Tons

Lake Superior District	1942	1951	1960	1970	1980
Minnesota high-grade	75,300	78,931	40,000	30,000	20,000
Michigan and Wisconsin	17,709	15,419	15,000	15,000	15,000
Total Lake Superior	**93,009**	**94,350**	**55,000**	**45,000**	**35,000**
Other U. S. Districts	13,700	21,840	22,000	25,000	25,000
Total U. S.	**106,709**	**116,190**	**77,000**	**70,000**	**60,000**
Foreign	750	10,145	37,000	45,000	57,000
Concentrates	.....	138	20,000	30,000	40,000
Total	**107,459**	**126,473**	**134,000**	**145,000**	**157,000**
Exports	2,000	4,296	.....	.....	.....
Net shipments for U. S. consumption	**105,459**	**122,177**	**134,000**	**145,000**	**157,000**

Courtesy Cleveland Cliffs

Some sources estimate reserves of Lake Superior ore at about 2.2 billion tons, exclusive of low grade ores. In Michigan and Wisconsin high grade reserves are practically all underground, some deep, some shallow. In order to mine these deep ores at costs which will not be prohibitive steel companies must cope with terrific mechanical problems and total labor costs 3 to 4 times as high as open pit.

In Minnesota there are approximately 700 million tons of open-pit direct shipping ores. Even these ores will be harder to get because 10 tons of material must be stripped in many cases to obtain a ton of ore.

Higher Costs Hurting

Since reserves of low-grade ores are estimated at a little over 8 billion tons it is expected that after 1970 well over half of our ore will come from concentrates and foreign ores. About 1.7 billion tons of the low-grade reserve is believed to be magnetic. Ore miners roughly estimate that 3 tons of magnetic ore will be mined to every ton of non-magnetic.

By 1980 it is believed that U. S. blast furnaces will consume at least 40 million tons of beneficiated ores. Initial costs will continue to be high. It is estimated that construction costs for producing taconite pellets average between $30 and $40 per annual ton. (Compared with $4 cost for open pit and $8 to $12 cost of underground mining.) Once the individual tonnage figure is expanded to cover annual production of 40,000,000 tons an investment of a billion to a billion and a half dollars can easily be visualized.

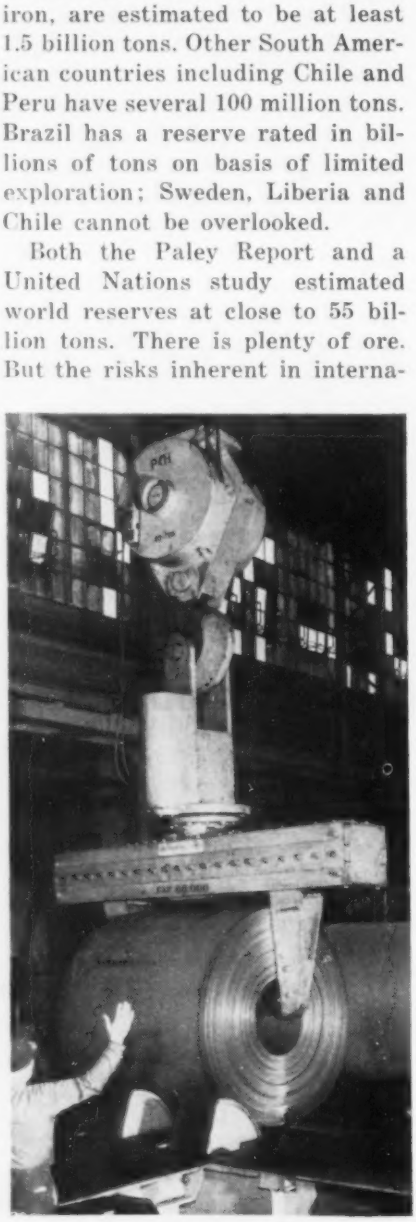
Expect Higher Prices

Answer to monumental cost lies for the most part in technology. If history repeats itself many authorities firmly believe an economical method of chemically separating silica and iron will be found. Coupled with cost savings in better processing this development could well bring costs into line. But regardless of advances in technology and processing ore men are resigned to the prospect of at least a 20 pct boost in the future cost of ore whether it comes from underground mines or beneficiation plants.

There's Plenty of Ore

What about foreign ores? Canadian reserves, including Labrador, are estimated at 1.5 billion tons with an iron content nearly 60 pct. Reserves of rich Venezuelan ore, much of it over 60 pct iron, are estimated to be at least 1.5 billion tons. Other South American countries including Chile and Peru have several 100 million tons. Brazil has a reserve rated in billions of tons on basis of limited exploration; Sweden, Liberia and Chile cannot be overlooked.

Both the Paley Report and a United Nations study estimated world reserves at close to 55 billion tons. There is plenty of ore. But the risks inherent in international relations seem to indicate that Canada and Venezuela will supply the bulk of our foreign ore within the foreseeable future.



SPECIAL COIL TONGS designed by Heppenstall Co., Pittsburgh, at work in Cleveland plant of Jones & Laughlin Steel Corp. Motorized tongs have capacity of 30 tons, handle coils from 20 to 72 in. wide.

Within the next 30 years some authorities estimate that Canada will supply about 27 million tons, Venezuela 24 million and other sources about 6 million tons annually. Construction of the St. Lawrence Waterway would help open the door for these predictions.

Cost of Labrador ore should be appreciably lessened with the advent of the seaway since some sources estimate that transportation savings of from 40 to 50 cents per ton can be effected through use of the water route.

Ores:

GSA to stop absorbing bonus on columbium, tantalum.

Industry buyers of tantalum and columbium ores originally bought by the government are going to find these materials more expensive.

General Services Administration says it will no longer absorb the cost of the bonus, 100 pct above market prices, it pays when purchasing the ores. The government has picked up the bonus tab since 1952 to stimulate production, but beginning immediately this cost will be passed on to customers.

GSA also has decided on two other changes affecting tantalum and columbium ore supplies:

1. From now on it will accept stockpile-specification tantalum ore in 1000-lb lots, half the former minimum quantity. Purpose of this change is to get more frequent deliveries from small producers. Smallest acceptable delivery of columbium will continue to be 2000 lb.

2. Ore-buying agents for the agency are being told to stop accepting applications from users wishing to buy stockpile-specification tantalum or Grade 1 columbium. Other grades of both tantalum and columbium are bought by the government, and these will be resold to industry customers.

USW: Tie Annual Wage to Jobless Pay?

Union proposes hitching guaranteed annual wage plan to unemployment compensation . . . Would guarantee jobless benefits for 52 weeks . . . Set up company fund—By J. B. Delaney.

It's questionable whether a guaranteed annual wage plan can be tied in with states unemployment compensation benefits as proposed by United Steelworkers of America.

The proposal is outlined in the February issue of "Steel Labor", official union publication. It's the same plan submitted by USW to Aluminum Co. of America last year. Alcoa rejected it.

Who Is Unemployed?

Under the plan, companies would pay 10¢ an hour into a trust fund to be used for unemployment payments to laid-off workers. Company liability would be limited to the amount of money in the fund.

The union proposes that qualified workers would be assured of benefits for a maximum of 52 weeks. The weekly benefit would amount to 30 times the worker's standard hourly wage. (See union example.) The payment would be made up in part by state unemployment compensation benefits and part by the company.

The proposal raises the question of whether a worker would be "unemployed" as interpreted by the various states if he were entitled to weekly payments from his employer. In Pennsylvania, for instance, vacation pay, separation pay, and holiday pay are considered "disqualifying income" by the Bureau of Employment & Unemployment Compensation.

Test Cases Needed

Charles Reiser, head of Pennsylvania's Unemployment Compensation Administrative Unit, Harrisburg, says the matter has come up for informal discussion and is a question for the Deputy Attorney General to rule on, eventually.

Mr. Reiser said there is no chance of a ruling without an actual test case. In short, Pennsylvania would not decide whether workers would qualify for state compensation payments under a plan as proposed by the USW, prior to its adoption by union and industry.

Possibly 14 other states are confronted with similar problems arising out of guaranteed annual wage plans, Mr. Reiser said.

While USW reiterates its determination to win a guaranteed wage from the steel industry, it admits the final form of such a plan is a matter for collective bargaining.

"From the very beginning, the union has emphasized that the GAW is a matter for negotiation and cooperative study with industry, a proposal to be hammered into shape at the collective bargaining table," "Steel Labor" says.

The matter is certain to be brought up by the union at collective bargaining sessions with steel producers in June. It's headed for strong opposition, and may be used only for trading purposes as it has been in the past. But recent prominence given the issue by the union may indicate a change of heart brought about by layoffs in the industry.

Use "Hard Way"?

In a discussion of the issue last year, David J. McDonald, union president, predicted eventual establishment of GAW in the fabricating and basic steel industries.

"Of course the guaranteed annual wage is feasible and practical," McDonald said, "and I repeat what I said at the outset—some day we are going to achieve it . . . I hope we don't have to make it the hard way, but if we do, we will make it the hard way." "Hard way" means through a strike.

The steel industry still hasn't figured out how it can guarantee wages in an industry subject to fluctuations in demand and with no way to put any appreciable amount of its product in inventory to level out production.

The industry considers the USW proposal another way of saying "unemployment compensation" rather than as a guaranteed wage. Eugene Grace, chairman of Bethlehem Steel Corp., recently characterized it as such and suggested that a better approach would be to strive for bigger unemployment benefits in which all workers could share—not just special groups of workers.

HOW IT CAN WORK

If the United Steelworkers' proposals (made to Alcoa) were used as a basis for a Guaranteed Annual Wage program, a Steelworker laid off for a 52-week period could count on the following:

Normal earnings

(incentive worker)

Standard hourly rate, Job Class 8 (av. class)	$1.905 per hour
Incentive earnings	.25 per hour
Overtime pay and shift premiums	.10 per hour
Gross amount	$2.255 per hour
Hours per week	40
	$90.20

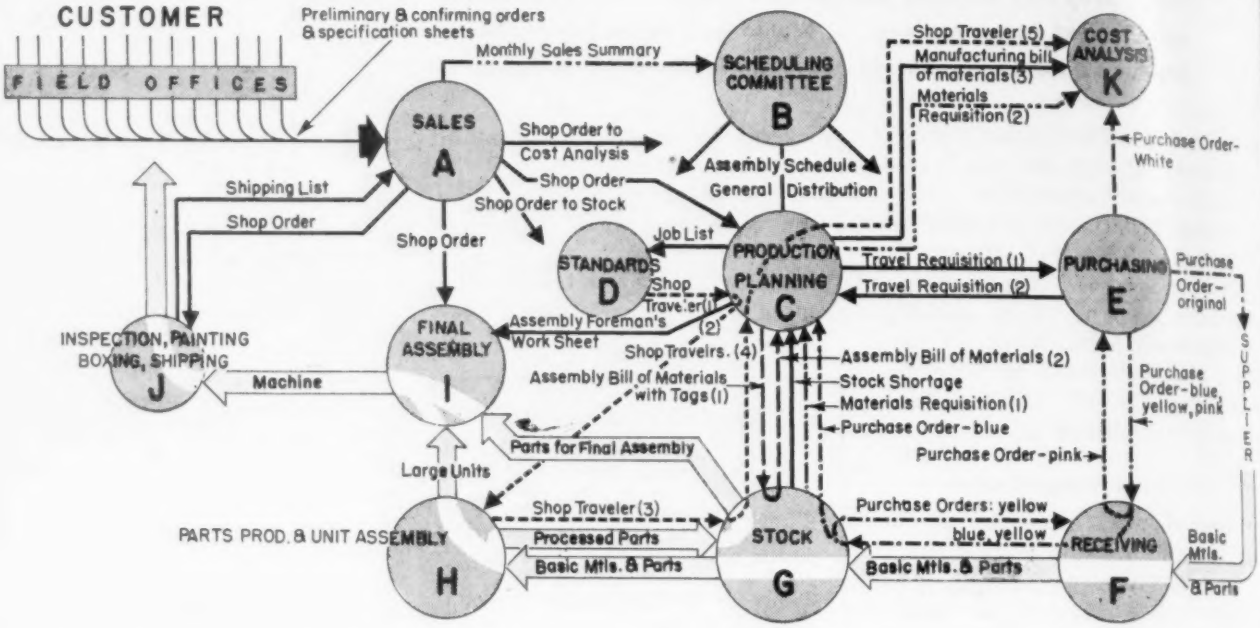
Weekly Guarantee

30 times the employe's standard hourly rate (30x$1.905)	$57.15

Benefit paid from:	
State Unemployment Compensation	$30.00
Company-financed trust fund	$27.15

The maximum benefit under unemployment compensation laws in most states is $30 per week. The maximum duration of benefits in most states is 26 weeks. If involuntary unemployment continued beyond 26 weeks, the total guarantee would be paid from the company-financed trust fund from the 27th week through the 52nd week of unemployment. In the foregoing hypothetical example, the unemployed worker would receive benefits totalling approximately 63 per cent of his normal earnings. — *From "Steel Labor"*

Operations Research Means . . . Put Your Problems on Paper



Research team made this flow chart of a prominent machine tool company. Flow charts sometimes contain factors management hadn't thought of. Hidden variables may then be translated into equations to solve management problems—*By R. M. Lorz.*

When a large chemical company can save $225,000 in inventory costs and another firm is shown how to cut set up time on some parts operations by 80 pct, industry wants to know how it is done.

In both these cases Operations Research was the clue to savings and more efficient operation.

What is it?

Answers Automatic

Operations Research (OR) is a method of scientific management. It involves mathematical problems that sometimes require electronic computors for solution. That seems to be what scares people most.

But the methods are not hard to understand. OR really means putting your management problems on paper. Researchers say the knack is in knowing how to follow up the problems with the proper equations: Once that is done, the right answers can become automatic.

If you call upon one of these research teams to solve a problem in your plant you can be sure it will take the broadest possible approach to plant operations and environment.

The research team will first concentrate on getting a *functional* picture of your firm's complete operation. This will probably mean scrapping of your standard organizational chart, and substitution of a functional flow chart—including everything from receipt of raw materials to finished product and marketing. Researchers will probe each step of your firm's operations. They will conduct extensive interviews, and they will study plant records and procedures.

In many cases, if researchers have covered their ground thoroughly, hidden variables can be translated into mathematical equations which provide a working model. But this can't be done until all factors have been thoroughly reviewed. This means getting them down on paper.

By juggling the ingredients in the quantitative model, the research team arrives at a functional operation plan which not only meets immediate needs but also provides a working base which should shift with future market developments.

Whether the making of a tin can or a shoe is involved it is usually possible to make R equal the cost of raw materials and U equal cost of producing a unit.

Key to the whole operation lies in controlling every facet of a firm's operations leaving nothing to be decided by guesswork or emotional thinking.

Stress Basic Process

Researchers admittedly face a tough problem in explaining their work to business men who must be convinced of its practicality. They sum it up in everyday terms by saying it simply affords management an opportunity to save money by changing operations on paper instead of by costly trial and error.

Those who want the explanation carried further might very well run into what appears to them a mathematical blank wall. And researchers don't stress that phase of their work, although they agree

Can Operations Research Help You?

While application of mathematical fromulas to everyday plant operations and management planning is not new (it was introduced after the last war) it is still surrounded by a lot of misunderstanding.

News of excellent results from applications of Operations Research has interested additional executives who want to know what it can do for their firm.

This is fine up to a point. But, while OR people are pleased at the pickup in interest, they are a little wary of where it might lead. There is, they point out, some mistaken tendency to regard it as a cure-all.

It is true they believe it may be possible to apply OR's scientific method to such seemingly abstract things as labor relations and policy decisions. But before these things can be accomplished they feel industry must support development of its own research teams, and be fully aware of what they are doing. This will help bring about full understanding of the nature of the tool.

Another reason for going slow is that OR is simply not yet available for wide use. At present there are OR groups established at Case Institute, Columbia University and M.I.T. In addition, there are only two commercial teams available for hire. A few firms have set up their own OR teams as integral parts of their organization.

Firms wanting to follow suit will feel the shortage of qualified researchers. It takes at least 2 years of full time academic training to turn out a qualified researcher.

that OR teams often must express problems in mathematical equations requiring electronic computation. They admit that this part of their work is difficult to translate, but they also feel that it is more important to the layman that basic elements of OR can be described and understood.

Cut Parts Cost

Take the case of one large metalworking plant which recently asked Dr. C. West Churchman and his associates at Case Institute to study its operations on a consulting basis.

A 3-man team, one representative from management and the others from Case, went to work. After reviewing every phase of the firm's operation for 3 weeks a flow chart was designed and researchers decided to concentrate on inventory and production scheduling of certain parts.

This particular area was chosen after the research team interviewed a number of executives and top production men in the plant. Many said current inventory was too high. They believed inventory should be kept to the bare minimum which would support current business.

Researchers took a different tack. They felt the fundamental problem was to reduce the cost of producing parts by scheduling optimum runs. Big problem formulated by this approach was: How to schedule parts so as to minimize the total cost of producing them?

Use Mathematical Solution

When the team set up its mathematical model of the scheduling problem every essential element was considered.

Nothing mysterious was done in arriving at a mathematical solution to this firm's problem. Researchers just pruned out operational factors which had the least effect on cost of producing a single part. From that point researchers experimented with the most important variables until they came up with a formula which indicated doubling of parts inventory, in process inventory, and run sizes. Flexibility of the recommended solution was contained in an equation which could be used in most circumstances to determine what size run would yield the lowest total production cost for this plant.

"How's business?"

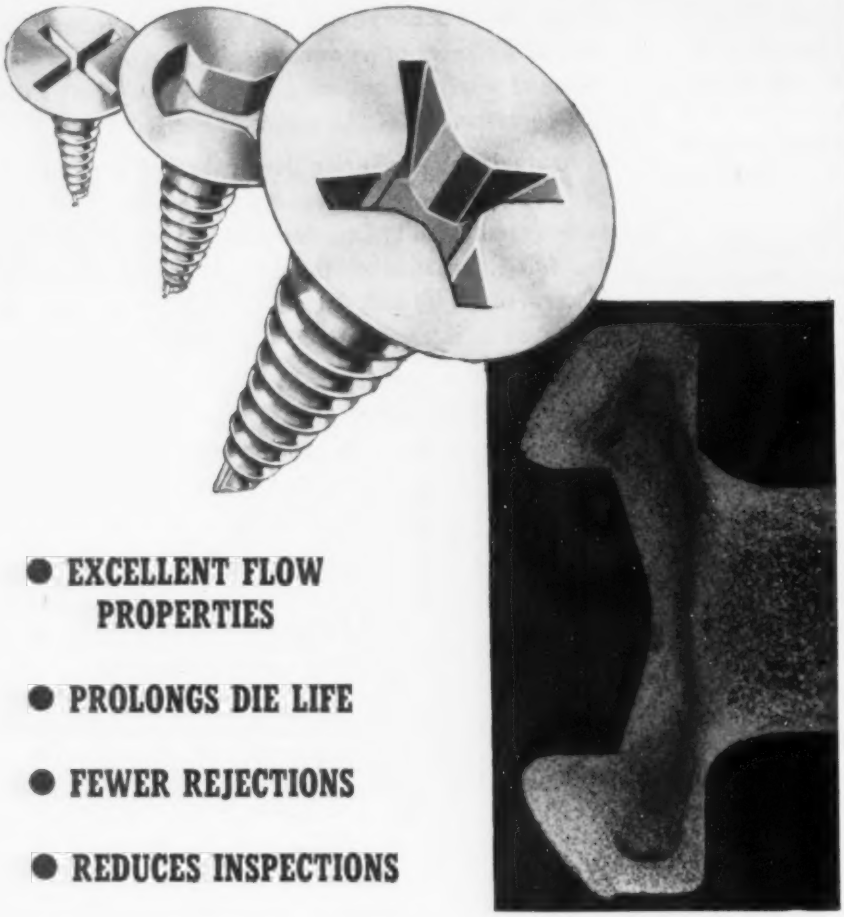
After the solution was submitted it was tried out on 23 critical parts. Although results could not be generalized immediately they were more than surprising to company personnel who thought all along that inventory was too high. Results showed that if average savings recorded on test parts could be extended to just 50 pct of the firm's parts production an overall saving of 10 pct in total production costs could be achieved.

Save Production Time

On the same basis a reduction of 12 pct in production time was indicated. By stretching out time between runs on certain parts a reduction of 80 pct in set up time was affected.

The same basic steps were taken by Arthur D. Little's OR group in correcting inventory troubles for a large chemical company operating 20 plants throughout the country. Seasonal fluctuations in sales kept many divisions in this company shuttling between extra-shift production and shutdown. By using a technique known as calculus of variations the OR team enabled this company to change scheduling operations and save $225,000 in the process.

KEYSTONE "SPECIAL PROCESSED" COLD HEADING WIRE



- EXCELLENT FLOW PROPERTIES
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The excellent grain flow properties of this superior cold heading wire assures the desired upsetting and die forming qualities you need for greater efficiency in the production of Phillips head, clutch head and cross-recessed head screws.

The structural soundness and uniformity of Keystone "Special Processed" Cold Heading Wire is attained by careful selection of raw materials, our own exclusive drawing and heat treating process, rigid quality controls and inspections. Compare the performance of Keystone "Special Processed" Cold Heading Wire next time you have a difficult cold heading problem to solve.

Keystone Steel & Wire Company
PEORIA 7, ILLINOIS

Watchmakers:

Seek tariff hike to maintain pool of precision workers.

A running battle between two segments of the watch industry has been resumed with U. S. Tariff Commission as referee.

Considerable interest attaches to the current hearing, since it may throw some light on the Administration's future international trade policies.

Curiously enough, Office of Defense Mobilization is sitting on the sidelines with no official refereeing power, but it may influence the final decision which will likely be made at the White House.

Report Further Decline

Basic question is whether watches, movements and parts are being imported in such quantities under preferential rates as to injure or threaten the future of the domestic watch industry. In 1952, the Administration decided they were not.

Domestic manufacturers, who make their own parts as well as assemble them, have had the matter reopened. Submitted figures tend to show a "further 27 pct decline in domestic production while employment has fallen 24 pct."

"He's barking up the wrong tree."

ODM enters the picture at this point. It is upon these manufacturing plants that the nation depends for precision workers to man the assembly lines turning out fuses and parts, gyroscopes and their intricate components, precision timing mechanisms, and scores of classified items.

Last year, U. S. Bureau of Labor Statistics took a look at the manpower situation. Its report warned that it is likely the manpower pool heretofore provided by the horological (watch and clock) industry would begin to dry up this year.

Watchmakers are hammering hard on this point. They say that as far as individual companies are concerned, their plants could be increasingly diverted to other work with no serious financial loss.

But, they add, the nature of the key skills and the long training time needed make it necessary to keep domestic watch manufacturing output at no less than present levels to retain the manpower pool.

Importers and assemblers objected to injection of the manpower angle. This argument was overruled by the commission chairman with the comment that the White House had specifically asked for this information.

Industry Accident Rate Off in '53

Reflecting increased industrial attention to safety, preliminary figures indicate no increase in work injuries during 1953 despite a somewhat higher average level of employment over 1952.

Bureau of Labor Statistics reports now being analyzed indicate that total disabling work injuries in all classes of employment for 1953 will add up to slightly more than 2 million.

No breakdowns by industry are yet available. However, manufacturing as a whole lost no ground. There was a 4 pct drop in injury rate which was offset by higher employment with the total injuries at 480,000, unchanged from 1952.

Mining, on the other hand, indicates a substantial improvement with a drop of 19 pct. Coal mining had its safest year on record with a 25 pct reduction in injury rates and fewer fatal injuries.

Construction

SEMISPHERE has market potential as multi-purpose building.

Look Where the Saucer Landed

Eskimos had the igloo idea first but R. G. LeTourneau, Inc., didn't see any reason why it couldn't use the same principle. And it did in its new giant Semisphere building at Longview, Tex.

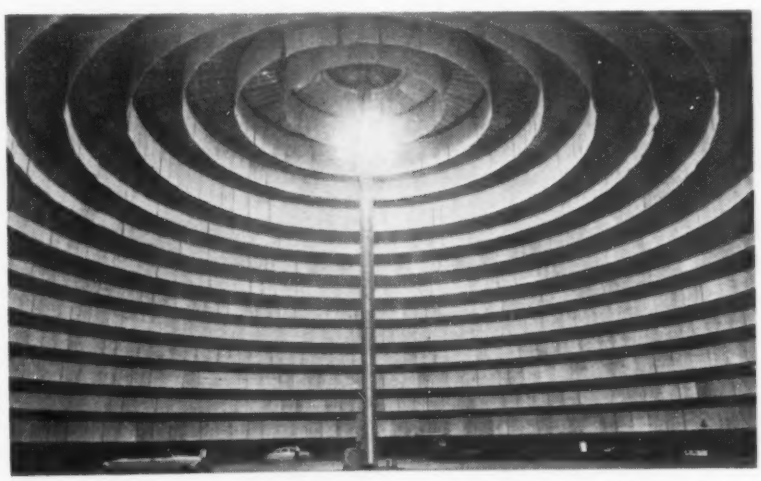
Built out of aluminum and steel, the Semisphere has almost 3.29 million cu ft of enclosed space and covers 70,686 sq ft of floor area. No interior structural supports are needed in buildings of this type and all assembly work is done at ground level.

LeTourneau says similar buildings can be erected anywhere in the world from prepared metal parts. Company hopes Semispheres will find a market as warehouses, freight centers, exhibition buildings, industrial plants, aircraft hangars, civic buildings, athletic stadiums. Completely erected, cost of the Semispheres is less than $4 per sq ft.

Worked From Top Down

In constructing its Longview building, LeTourneau worked from the top down, although all the assembly work was done on the ground. First step is to put up a 94 ft steel center pole which is used during construction but may be taken down later.

Next a sliding steel collar is raised gradually up the center pole as 15 successive rings of aluminum sheets are bolted on. When the last ring is bolted, the steel collar is 85 ft up the center pole. Bottom edge of the completed building is then lowered and secured to a concrete foundation ring.



CONCENTRIC rings of acoustical material are suspended inside Semisphere for sound control.

SPOKANE: Metals, Power Spur Growth

Hydro power, aluminum sire industrial growth of Inland Empire . . . Population rose 32.5 pct in 10 years . . . Power needs outrun supply . . . Metals, atom center—*By T. M. Rohan.*

Last year the Spokane Chamber of Commerce counted up aluminum fabrication plants in the city and found 22 with employment of about 800. This month annual report time came around again and the Chamber found 33—almost a new plant a month for a whopping 55 pct overall increase in 1 year. Ten years ago there weren't a half-dozen in the area.

The story is typical of industrial and population growth in the so-called Inland Empire. Although the metalworkers haven't pushed the lumbermen, farmers and miners backstage yet, they're gaining fast. In the 150,000-sq-mile area between the Cascade and Rocky Mountains centered around Spokane, aluminum and low cost federal power have fathered a thriving industrial growth. Most of the power comes from rivers and Spokane even has one right in the middle of downtown.

Use Outstrips Supply

With civic encouragement, manufacturing plants have set up shop in Spokane and environs by the score. They have given the area a much needed stabilizer against widely fluctuating mining, farming and lumber industries. Industrialization has attracted a large share of the Inland Empire's population gain of 32.5 pct in the 1940-1950 decade, percentagewise one of the highest in the U. S. and with no end in sight.

Only fly in the ointment is that industrial growth may now outspeed development of the power which first attracted it. Although private utilities are taking up the slack from cutbacks in federal power developments, Bonneville Power Administration contracts now permit no major expansion over 10,000 kw within the next 5 years, especially in high consumption fields like electrometallurgical. Almost all types of lower consumption industries can get adequate power with no trouble.

GRAND COULEE Dam near Spokane, backbone of the Bonneville power system.

Building Outlook Good

Local industrial outlook for 1954 is healthy with only a slight dip expected. Heavy government construction and plenty of water behind the dams to avert a power shortage help bolster the economy. In 1952 about 2000 were idled in Spokane alone by power cutoffs from low water conditions. Lumbering, the area's No. 1 industry, is expecting a slight dip; mining markets continue to sag and farm income, while still healthy, is down.

Nearby Hanford Works of Atomic Energy Commission is currently in a $175 million building program, Fairchild Air Force base is in a $5 million expansion and new road construction will total about $17 million this year. Homebuilding in the city alone is expected to equal 1953 at about $17 million, 30 pct over 1952. Industrial and commercial expansion in the area is expected to drop only slightly from '53's $16 million.

Expand Atom Plants

Overall industrial growth has hinged directly on harnessing of the Columbia River and resulting low cost hydro power for industry and aluminum. In a land where bigness is traditional, the Inland Empire boasts Grand Coulee dam, world's largest masonry structure and backbone of the Bonneville

Power System at 1.9 million kw.

Hanford Works of Atomic Energy Commission at Richland employs 9000 with a $1 billion expansion now going on. Hanford is second only to Oak Ridge, Tenn.

Acknowledged center of this is Spokane with about 175,000 population or 15,000 since the last official count in 1950. Hub of an area population of 1 million, five transcontinental railroads make it a major distribution center. Department stores, for example, estimate 50-60 pct of sales from out of town. In services like dentistry it hits 80 pct.

Nonferrous Yield High

The Empire's major contribution to the national metals picture is undoubtedly mining of lead, zinc, silver and copper. The three major areas—Coeur d'Alene in northern Idaho, Butte region of Montana and Kootenays in British Columbia—have each produced about $1 billion in mineral wealth through the years.

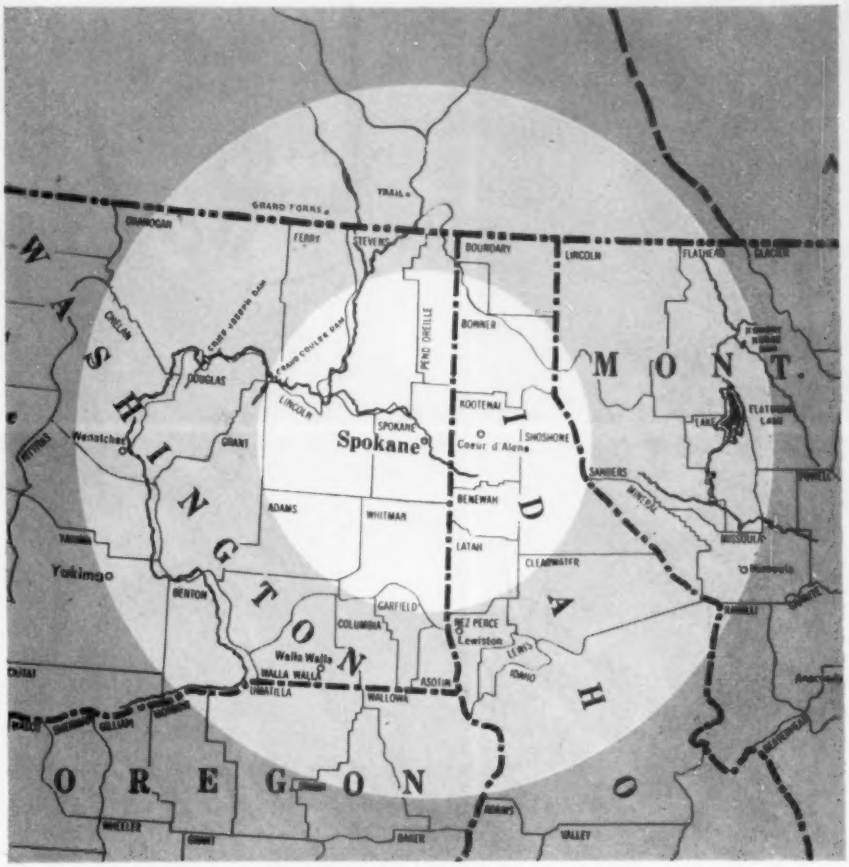
The area has the largest known body of zinc and lead outside the Iron Curtain and purity has increased as drilling deepens. In the boom year of 1951, metal yield in the so-called Metaline area alone was $9 million. In the Coeur d'Alene area are 150 mining operations of different companies.

Modernize Mines

In the Anaconda area is the "Greater Butte Project" to claim low grade copper ore. To the north in Trail, B. C., is the mammoth electrolytic lead-zinc smelter of Consolidated Mining & Smelting of Canada.

Dwindling markets since 1952 have made deep inroads into mining operations but resources continue tremendous. Mines there have become leaders in mechanization with major firms investing millions to improve efficiency and longevity of operations.

Major impetus to aluminum fabrication has been proximity of the Kaiser aluminum reduction and sheet mill in the Spokane suburbs of Mead and Trentwood with em-



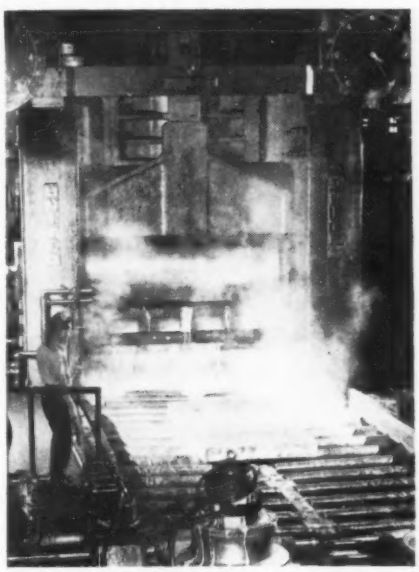
ployment of about 5000. The Mead and Trentwood plants were built by Alcoa for Defense Plants Corp. in World War II to supply West Coast airplane plants and are second in size only to Kaiser's new Chalmette, La., plant. Annual capacities are 175,000 and 200,000 tons respectively. Original Mead rating was 105,000.

The Trentwood sheet mill turns out sheet and plate for aircraft, siding, shade screening, roll formed shapes, etc. First U. S. production of induction welded irrigation pipe from strip by cold forming and welding was recently started there in the heart of a major irrigation pipe market. A local firm, Aluminum Supply Co., turns out the same product by resistance welding.

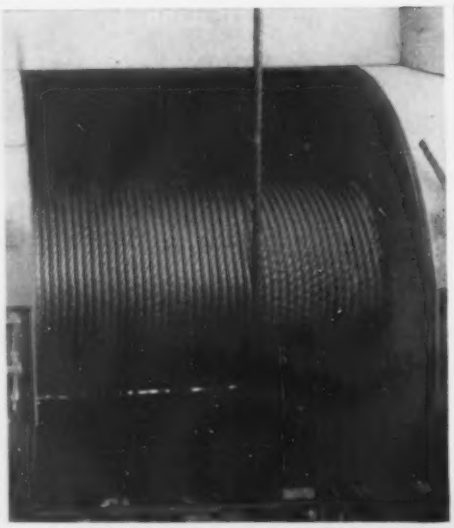
Alcoa's new Wenatchee, Wash., reduction plant is also becoming a major supply factor with 85,000 annual tons projected capacity. The government-owned magnesium plant at Spokane, operated by Pacific Northwest Alloys, produces ferrochrome and ferrosilicon.

Spokane's aluminum fabricators and four light metals foundries turn out everything from boats to storm windows.

Major use of steel mill products in Spokane is for construction and mining machinery, plates and light structurals for pressure vessels and structures. Scrapwise it is a fringe area for Seattle and Salt Lake City and has suffered heavily in recent market declines.

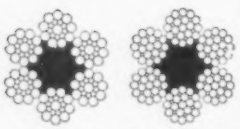


KAISER 120-in. aluminum rolling mill at the Trentwood, Wash., plant.



ABRASION often gives wire rope a beating. Rope is squeezed under tremendous pressure on rotary drilling drums in Texas oil fields. In the Northwest it drags under heavy logs. In mining it is scraped over rocks to operate slushers. Everywhere it is rubbed severely on winches that do not wind smooth. Under such conditions Red-Strand 6 x 19 Seale wire rope lasts longer and saves money.

What can you do better with 6 x 19 Seale Red-Strand?



6 x 19 Seale 6 x 19 Filler Wire

6 x 19 Seale has the same strength and weight as the more frequently used 6 x 19 Filler Wire, but the arrangement and size of the wires is different. You can see in the diagrams that the outer wires are fewer in number and larger in size. They provide *high resistance to abrasion* and greater wearing quality with somewhat less flexibility.

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WIRE ROPE

—Employment—

Jobs:

Unemployment rise brings plea for surplus war plant shift.

The Defense Dept. has been urged by Congress to make a quick decision with reference to distress labor areas as to which war plants, now closed down, can be made available to private industry for non-defense types of production.

This move coincides with action of U. S. Labor Dept. last week in adding Detroit and Toledo to the list of 20 distress areas where unemployment amounts to 6 pct or more.

Both Detroit and Toledo are now entitled to preferential consideration in the awarding of government contracts. This means that when bids are tied, the distressed plant gets the award.

See May Pickup

Unemployment in both areas is running close to 9 pct of the total labor force in the areas, surveys show. But Labor Dept. says it expects employment to stabilize at current levels in early March and pick up to some extent by May.

Detroit unemployment is blamed largely on auto plant layoffs.

At the Pentagon, Charles Wilson said no special effort would be made at this time to channel new defense contracts to Detroit.

Based on historical patterns, he pointed out that the automobile business is never good in wintertime but is generally all right by spring.

He is supported in this belief by Sen. Homer Ferguson, R., Mich., who agrees that wide-scale unemployment in the motor center is largely temporary.

Meanwhile, for the first time in many months, national employment dropped slightly below the 60 million figure. In addition to auto cutbacks, a big factor in the overall picture was construction work which was reduced greatly by weather conditions.

Census Bureau figures show that in mid-January the unemployed were at 3.8 pct of the total labor force.

TITANIUM: More Than Enough—For Now

Supply of titanium tops demand as new sponge capacity developed faster than expected . . . Condition is temporary . . . Metzger urges users buy more—*By J. B. Delaney.*

Titanium is suffering through another attack of growing pains. The diagnosis: acute expansionitis. Duration: temporary.

Producers say the trouble is that new sponge capacity has come in faster than expected—too fast for the industry's biggest customer, the Air Force. Some sponge may be stockpiled during the summer.

Everybody agrees the situation probably won't last long. The industry had a similar experience in last half of 1952. At one time there was a sponge stockpile of 300 tons. Last summer there was worry over a possible shortage. (THE IRON AGE, June 18, 1953, p. 94). One guess is that demand again will outstrip supply by fourth quarter. Position of producers even today is not uniform.

That's the way it's been going in this new industry. New applications sometimes lag, sometimes move ahead of capacity. Many new uses for military aircraft are in the testing stage but months may go by before some of them are finally accepted. Also, some users hesitate to expand applications without assurance of adequate supply.

Must Find Cheaper Way

Use of titanium in jet engines has not progressed as fast as expected. One reason is that some producers are finding it hard to meet strict material specifications, and admit it. Although titanium quality is constantly improving it is still one of the industry's biggest problems. But no one expected the answers to come overnight.

Both the producers and the military would like more industries to become familiar with the metal and its fabrication techniques. But in the same breath they admit this isn't likely to happen except in an experimental way until they find a cheaper method of producing it. Titanium sponge, the metal's raw material, sells for $5 per lb.

A new process just out of the laboratory may help. Its sponsors say they may be able to produce sponge for less than $1.50 per lb (THE IRON AGE, July 9, 1953, p. 73). A pilot plant was scheduled to begin operation last October.

Remelting of titanium scrap offers promise of cost savings. Allegheny Ludlum Steel Corp. is using a consumable electrode process for recovering scrap generated in its own plant. But the tons of scrap in fabricators' shops is still untouched.

Ahead of Schedule

In a bulletin to users of titanium Gen. Kern D. Metzger, USAF, director, Aircraft Production Resources, estimates that titanium producers can now deliver about 300,000 lb of titanium mill products per month. But by next June this may rise to 600,000-700,000 lb per month, he added.

A major factor in the anticipated increase in production is that Du Pont's sponge capacity is expected to reach 10 tons per day by April or May, about 3 months ahead of schedule. Present Du Pont capacity is about 5 tons per day.

Companies using Du Pont sponge are Rem-Cru Titanium, Inc., Republic Steel Corp., and Mallory-Sharon Titanium Corp. Titanium Metals Corp, of America, which produces its own sponge, can deliver between 100,000 and 120,000 lb of titanium mill products per month.

Government contracts currently call for sponge procurement of 13,500 tons from E. I. Du Pont de Nemours & Co. in 5 years, 18,000 tons from Titanium Metals Corp. of America in the same time and between 6000 and 7500 tons from Cramet Co.

Sees Adequate Supply

Gen. Metzger noted that 1953 brought a "significant" improvement in titanium metal quality and that a weldable alloy has been introduced and is now in production.

"In spite of this improvement in the supply and quality of titanium," Gen. Metzger said, "the order boards of the titanium producers are reflecting a definite decline in production orders. It is suggested that companies interested in using titanium in their products take this opportunity to further their plans in promoting increased utilization of the metal because it is evident that there will be more assurance of an adequate supply to meet most planned production programs in 1954."

In fact, Sen. George W. Malone (R., Nev.) is calling for speedier titanium expansion, and an industry less dependent on foreign ores. During a hearing by his Interior Subcommittee on Domestic Ores, Sen. Malone said military needs alone require titanium capacity of 150,000 tons annually.

Set New Melting Goal

Latest Washington action on accelerated amortization sets a new target for expansion of titanium melting capacity. Interim goal calls for facilities capable of melting 37,500 tons annually by 1956. Industry now has a melting capacity of less than 8000 tons.

Production of sponge titanium kept up its doubling habit in 1953 with a total output of 2241 tons. And it's expected to at least double again in 1954. Comparable figure for 1952 was 1075 tons; for 1951, 495 tons.

Congressional concern has set wheels in motion for a survey which will determine definitely what defense needs are for titanium and set up a timetable for its production.

Dr. Herbert H. Kellogg, chairman of Columbia University School of Engineering will head a special committee being set up by Office of Defense Mobilization to make the study.

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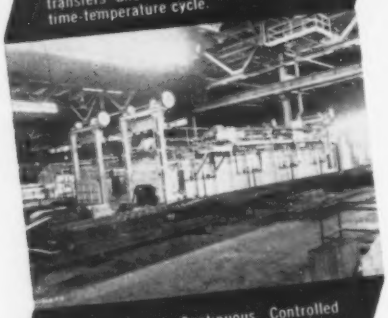
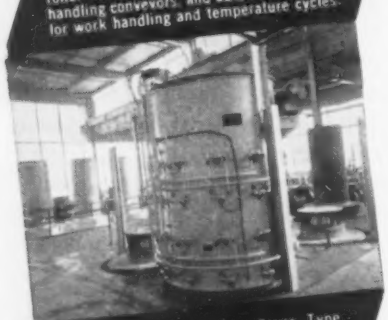


Two Continental Continuous Controlled Atmosphere Annealers, roller rail type, complete with transfer cars and conveyor systems.

Continental Stamping Annealer, continuous roller rail type, complete with baskets, handling conveyors, and automatic controls for work handling and temperature cycles.



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BATTERY:

Claim 1950 cell converted nuclear to electric energy.

Ohmart Corp. of Cincinnati has revealed that in 1951 it first started marketing commercial laboratory and industrial devices using the principle of direct conversion of nuclear into electrical energy.

Commenting on Radio Corp. of America's recent demonstration of an atomic battery powering a transistor amplifier (See THE IRON AGE, Feb. 4, p. 85), Philip Ohmart, firm president, states that in 1950 he demonstrated to the Air Force a similar device that actually ran a miniature electric motor of about 1 microwatt power.

While THE IRON AGE article did not state that RCA was first to do this, some readers drew that conclusion and some news sources carried a statement to that effect.

Gas Separates Electrodes

Actually, principles underlying both the RCA and the Ohmart atomic batteries were first noted 40 years ago or more. Difficulty lay in cutting voltage to manageable levels and stepping up current values to useable quantities.

In the Ohmart cell, which was called an atomic battery in 1951 newspaper articles, two electrochemically dissimilar electrodes are separated by a normally un-ionized gas. Exposure to radioactivity results in electrical output.

Mr. Ohmart told THE IRON AGE that in his original patent applications, made in 1951, he suggested the use of denser un-ionized liquids and solid semi-conductors to step up the efficiency of his original cells. His original observation of the direct conversion phenomenon took place on June 9, 1950, while he was working at the Atomic Energy Commission's Mound lab.

The firm which was then formed to develop applications of the principle did not, since it lacked adequate facilities, go into research and development of a cell using a semi-conductor but stuck with the gas-filled battery.

MAGNESIUM: Pace Slow, But Steadier

Foundrymen feared a flooring like they got after World War II . . . Stretchout has leveled 20 to 35 pct below peak . . . Now fight for civilian markets—By K. W. Bennett.

What's happened to magnesium castings? When the bottom began to drop out of defense orders in July and August of 1953, there was some tight-jawed speculation that "mag" was on its way out until the next national emergency.

As February came in a few of the hardier magnesium adherents were crawling out of the trenches. The defense dropoff appeared to be leveling. After beginning to slide in August and swinging down through December, defense business for magnesium castings is reported leveling at about 20 to 35 pct below the booming output of first half 1953.

Jets Use Less

Tonnage shipment estimates indicate the magnesium falloff in latter 1953 couldn't do much to pull the year-long total down. An industrial source estimates that 17,429 tons of castings were shipped in 1952. In 1953, despite alarming reports, the castings shipment figure attained an estimated 17,200 tons. Shipments of sheet, extrusions, and forgings dropped from 9133 tons in '52 to an estimated 8700 tons in 1953. It is notable that during this time, permanent mold castings increased their tonnage by better than 100 pct.

It's universally agreed that the defense dropoff came fast and hit hard. Subcontractors were hit hardest but everybody suffered. The switch from reciprocating engines to jet engines, which use fewer large magnesium castings, was partly to blame. The general defense stretchout that left magnesium castings buyers with heavy inventories was another cause. Aircraft, largest user of magnesium parts, was the hardest hit, but some magnesium has been going into Signal Corps and Ordnance applications, and these too were hit sharply.

Civilian Demand Small

There is still frank pessimism among many veteran magnesium users. But they think enough of the future of this light metal to begin attacking the civilian market in force. Pricing is stiffly competitive.

Civilian demand hasn't been able to soak up the available large castings capacity. Diecasting could be an alternative, but most sand foundries are discounting it. Capital investment is too high. One magnesium foundryman reported being offered diecasting materials at prices competitive with permanent mold materials. He turned the offer down.

Stress Sales Forces

More foundries are considering dry and green sand casting, squeezer molds which would allow high output of small parts, and permanent molds. Squeezer molds seem to have a popularity edge, but some sources indicate their own squeezer operations are not in full use.

For at least some small shops, the new theories seem to work. A very small foundry operating about 6 months began with 100 pct defense business. To date, the government business has been halved, civilian business increased by an equal amount. Dry and green sand casting are the methods used, along with an oversize sales force.

For larger foundries the problem is considerably more difficult, and these shops are expected to increase their selling forces, and look hard for further defense work. Defense bids have reportedly been pushed down sharply in some instances. Most feel they will not pick up enough civilian business during 1954 to even begin to offset the defense loss of latter 1953.

Went Bust After War II

Considerably more primary magnesium is expected to be diverted from foundry consumption during 1954 because of increased rolling and extrusion capacity. Sheet rolling capacity will increase a minimum of fivefold, and extrusion capacity should double. Sheet sales were already reported edging up in January.

Magnesium hit the floor after World War II, when a peak of 37,610 tons of sand castings were shipped in 1944, and by 1947 this tonnage had fallen to 3202 tons. Outlook for the post-Korean period suggests that the old boom-and-bust cycle may have been bent, though not broken. In the mild recession of 1949 magnesium sand

Turn Page

Annual Shipments of Magnesium Products

Net Tons, Industry Estimates

	Sand Castings	Die Castings	Permanent Mold Castings	Sheet	Extrusions	Forgings
1953	11,550	3,050	2,600	3,500	5,000	200
1952	11,929	4,500	1,000	3,500	5,433	200
1951	11,413	3,500	500	3,800	5,245	500
1950	6,790	573	250	2,632	3,670	104
1949	4,808	468	250	1,537	2,395	200

EXPANSION: ODM Sets New Targets

Latest action leaves 90 goals open, 3 suspended, 149 closed . . . Military aircraft, ordnance moved to open-goal list . . . Titanium melting set for five-fold increase.

Office of Defense Mobilization has established new expansion targets in four segments of the transportation field and transferred 17 industries to the open-goal list, wherein further growth will be encouraged.

New goals apply to airport, motor truck terminal and repair, inland waterway terminal, and ocean port facilities. No maximum dollar amount or tonnage figure is being used, and applications for fast tax writeoff privileges will be considered on an individual basis.

Industries moved to the open-goal list include military aircraft, ordnance, warehouse and storage, Portland cement, Alaskan coal, wire braided hose, and certain chemical facilities.

Requirements for refrigerated storage space, ODM says, necessitate expansion of 10 to 12 million cu ft annually this year and in 1955. The agency expects to issue very few certificates of necessity for dry or liquid-storage facilities.

Expanded facilities capable of turning out 4.5 million bbl of Portland cement are being sought this year. ODM will consider applications for fast tax writeoffs covering new facilities for 2 million bbl in Southern California and 2.5 million bbl in Michigan.

Revised target for nitrogen production calls for capacity to turn out 3.5 million short tons annually by Jan. 1, 1957. This goal includes such items as synthetic ammonia, and nitraphosphates.

Potential military demands for titanium are foreshadowed by setting an interim goal which would expand titanium melting facilities almost five-fold by 1956.

Called for in the goal are facilities for processing 37,500 short tons of titanium sponge or scrap. Currently, the domestic industry has a melting capacity which is estimated at about 7680 tons per year.

The four smelters now in operation are planning expansion moves which should result in total U. S. output of at least 11,880 ingot tons by 1956.

All aspects of the titanium industry are under review by ODM. The agency will set a new goal for melting facilities when it completes the study.

U. S. IS BACKING this Belgian-designed .30-cal. self-loading rifle for use by NATO forces. Rifle is gas operated, can fire 700 rounds per min.

Put Cost at $29.2 Billion

The foregoing actions leave 90 expansion goals open, 3 suspended, and 149 closed.

Begun in 1950, the tax amortization program has been extended to more than 18,000 new or expanded facilities, estimated to cost $29.2 billion. About $17.5 billion of this expansion has been approved for fast writeoff.

Takes Over Army Budget Policy

Army budget policies are now being directed by George H. Roderick, Grand Rapids, Mich., businessman, who was sworn in last week as Assistant Secretary of the Army.

The new official, who has primary responsibility in the fields of fiscal accounting and politico-military relationships, will be handling some of the duties formerly performed by Earl D. Johnson, until recently the Army Under-Secretary.

Mr. Roderick joined American Seating Co., Grand Rapids, in 1923 and became its vice president and director in 1947, holding this position until a short time ago. He also has held directorships of Newport Steel Corp., Newport, Ky., and of the Michigan National Bank, Grand Rapids.

Production

Continued

castings had already risen to 4808 tons, and by 1950 to 6790 tons.

With aircraft still the dominant buyer of formed magnesium, there is increasing opportunity in other fields. Foundry equipment, business machine parts, air tools, camera parts, optical equipment and goods, X-ray appliance parts, truck bodies, and even a lightweight bassinet.

The machineability of magnesium, with its resulting cost savings in machining time and tool life, is being pushed. An anodic coating developed early in 1953 has been called a "white hope" for boosting magnesium sales another hitch.

The picture suggests readjustment of large sand casting suppliers to a much slower pace, since defense work was pegged originally for much higher production. But extrusion and sheet have assumed considerably more importance than they had in 1946, and despite the lag during 1953, are growing.

Quantity PRODUCTION of GREY IRON CASTINGS

ONE OF THE NATION'S LARGEST AND MOST MODERN PRODUCTION FOUNDRIES

ESTABLISHED 1866

THE WHELAND COMPANY

FOUNDRY DIVISION

MAIN OFFICE AND MANUFACTURING PLANTS

CHATTANOOGA 2, TENNESSEE

Industrial Briefs

At Your Service . . . LATROBE STEEL CO., Latrobe, Pa. has opened an office in St. Paul to serve customers in Minnesota, North and South Dakota, Nebraska and northern Iowa.

Foundry Opened . . . QUAKER ALLOY CASTING CO., a newly formed company, has opened a foundry at South Cherry St., Myerstown, Pa. Equipment will include 650-lb induction furnaces and gas-fired heat treatment and processing equipment suited for small casting production specialities. First output is expected in early April.

Sales Rep . . . ADAMAS CARBIDE CORP., Kenilworth, N. J., has appointed Allied Carbide Products, Willow Grove, Pa., as its sales representative for eastern Pennsylvania, southern New Jersey and Delaware.

Director Elected . . . Dr. Thomas P. May, of INTERNATIONAL NICKEL CO., INC., Corrosion Engineering Section, Development & Research Div., has been elected a director of the National Assn. of Corrosion Engineers.

Fourth Series . . . NEWARK COLLEGE OF ENGINEERING, will start its fourth series of sales engineering conferences on Feb. 23.

Training Program . . . CARBOLOY DEPT. of General Electric Co., Detroit, is planning a series of streamlined distributor sales training programs to help authorized Carboloy distributors salesmen do a more effective selling job.

Record Topped . . . MESTA MACHINE CO. topped all its previous safety records in 1953 and also received the Certificate of Merit for Safety presented annually by the Pennsylvania Dept. of Labor and Industry.

Michigan Plant . . . PACKARD MOTOR CAR company has built a new plant adjacent to its proving grounds at Utica, Mich., for manufacturing engines, automatic transmissions and axles.

Shipped . . . BLAW-KNOX CO.'s Lewis Machinery Div., Pittsburgh, has shipped a hot slab shear to the Clairton Works of U. S. Steel Corp. to be used with the company's new 40-inch silicon slab line.

Come One, Come All . . . NATIONAL ASSN. OF ENGINEERING COMPANIES plans to establish a Cleveland Chapter and has called a general meeting of independent engineering companies in the area. Get-together will be at the Cleveland Hotel, on Feb. 22.

New Dealer . . . HYSTER CO., Portland, has appointed Bode Finn Co. a dealer for its industrial truck equipment.

Coming Up . . . UNIVERSITY OF WISCONSIN will hold an engineering meeting on industrial ventilation Mar. 16-17.

Established . . . INGALLS SHIPBUILDING CORP., Birmingham, has established a Washington office at 1411 Pennsylvania Ave., Occidental Bldg. Wesley L. Hemphill is manager.

Branch Office . . . OTIS ELEVATOR CO. has opened a branch office in Lima, Peru. C. B. Scrivener is acting manager.

Started Up . . . REPUBLIC STEEL CORP.'s pipe plant at Gadsden, Ala., resumed production earlier this month. Steel production will not be affected immediately since the plant has been operating at only about 50 pct of capacity.

PRESIDENT OF TURKEY Celal Bayar pauses in his recent tour of Republic Steel Corp.'s 98-in. strip mill in Cleveland to talk with fellow countryman Nick Kostas, a painter for Republic. Charles M. White (wearing hat), president of the company, looks on.

Mobile Lab . . . SHARON STEEL CORP.'s Brainard Steel Div., Warren, Ohio, has a laboratory on wheels which will be used to test new methods of using steel strapping in shipping.

Big Job . . . AMERICAN MANAGEMENT ASSN., New York, has appointed James M. Black, manager of the personnel division. He will be responsible for program planning of conferences and seminars in the personnel field.

California Office . . . THE ELECTRIC CONTROLLER & MFG. CO., Cleveland, has opened a sales and engineering office at 6066 East Olympic Blvd., Los Angeles. John R. Woodruff will be Pacific Coast district manager.

Distributor . . . THE BERYLLIUM CORP., Reading, Pa., has appointed Meier Brass & Copper Co., Detroit, distributor of Berylco beryllium copper strip and rod in Michigan, northern Ohio, and northern Indiana.

Dividend . . . BASIC REFRACTORIES, INC. has voted quarterly dividends of 25¢ per share on the common stock payable Mar. 31, and $1.43 per share on the preferred stock payable Apr. 1.

Digs In . . . MATHEWS CONVEYER CO., Ellwood City, Pa., broke ground last month for construction of a new office and engineering building and an addition to the present building.

Acquires Stock . . . EATON MFG. CO., Cleveland, has acquired all the common stock of Spring Perch Co., Lackawanna, N. Y.

New Member . . . CONTROLLERS INSTITUTE OF AMERICA, has elected John P. Bodle, secretary-treasurer, Portland Forge & Foundry Co., Portland, a member.

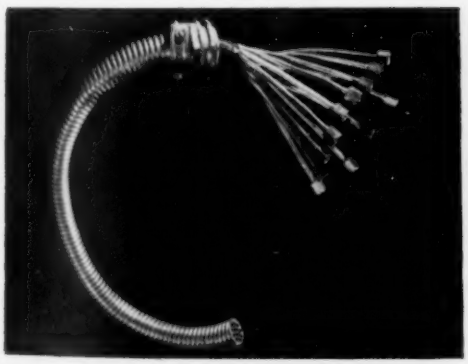
Signing Up . . . ARMCO STEEL CORP. has inaugurated a stock option plan which will enable employees to purchase a total of 300,000 shares at approximately 5 pct below New York Stock Exchange closing price on Jan. 29.

Coming Up . . . The Oregon Section of AMERICAN INSTITUTE OF MINING & METALLURGICAL ENGINEERS will be host to the AIME Pacific Northwest Metals & Minerals Conference in Portland, Ore., Apr. 29 to May 1.

For the new pneumatic instrumentation

Cabled Tube

The recent tremendous increase in the use of tube instead of wires for instrumentation and control purposes has led to an important new development—cabled tube. This is an armored group of long tubes twisted together to permit bending without distortion. An insulating tape is wrapped over the bundle of tubes to prevent electrolytic action. Then interlocking, flexible galvanized steel armor is applied, like BX. This protects the tubes from injury during shipment, storage, installation, and in service. Standard fittings, boxes and cabinets can be used for junction boxes and terminations. To make it possible to readily identify each tube, one tube in each layer is colored; the position of each tube in each layer in relation to the coded tube

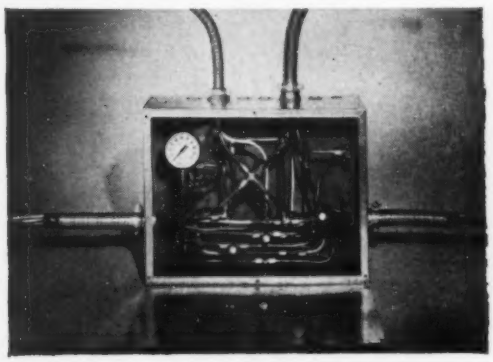


remains the same throughout the length of the cable.

The tubes usually are copper, but aluminum tubes can be used for special purposes. For unusually corrosive situations, a plastic outer sheath can be applied. As many as 19 tubes, ¼" OD, can be cabled, and supplied in lengths up to 1,000 ft.

Showing the construction of Crescent Armored Multitube, made by Crescent Insulated Wire and Cable Co., Trenton 5, N. J., which will supply further information on request.

Since the tubes carry not electricity but air, nitrogen, helium, or a fluid, they are especially attractive in potentially explosive locations, as in refineries and chemical plants. Utilities are also turning decisively to this new cable, while automatic process control (automation) is a rising application.



Revere, as a supplier of tube for this purpose, calls this cabled tube development to your attention as a matter of general and perhaps specific interest. See Revere for copper, aluminum and brass tube and pipe, electric welded steel tube, and lockseam tube. Call the nearest Sales Office.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y. Sales Offices in Principal Cities, Distributors Everywhere

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Modern Blue Laws Chafe Automakers

Annual avalanche of proposed state laws harass auto industry . . . Most bills well-intentioned, but many ill-advised . . . Seven states set national pattern—*By R. D. Raddant.*

Among the major problems of the auto industry are the thousands of state laws and codes that affect the manufacture of automobiles.

During 1953, an estimated 17,000 bills were introduced in 44 states affecting automobile manufacture in one phase or another. About 8000 were primarily concerned with automotive equipment. This year, an off year for many state legislatures, only about 5000 bills will be introduced.

Some Are Good . . . Not all these bills are bad pieces of legislature. But thousands of them are ill advised, conflicting with other laws, or lobbied by special interests not always for public welfare.

Automakers, therefore, have three problems. One is getting new features approved in all states where "permissive" legislature is needed so use won't be restricted in individual states. A second is to avoid laws that have the effect of telling manufacturers how to make their cars. A third is to ward off legislation that may do more harm than good.

With the number of bills introduced, there are many examples that illustrate each point. A current one is a bill before the New York State legislature requiring that each car registered in the state be equipped with a defroster approved by the highway commissioner. This seems to be a harmless bill, but it has already been vetoed twice by Gov. Dewey.

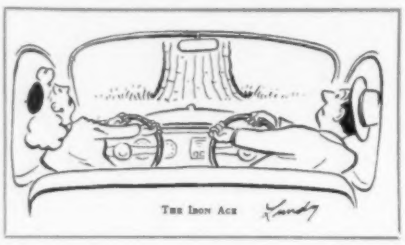
Who Knows? . . . In the first place, there is no standard defroster or standard of performance for defrosters in the industry. It would require the state to build cold and hot rooms and staff them at a cost of more than $100,000. Some defroster units are built into the cowl with part of them an integral part of the auto body. Testing these units would be a very complex job.

One bill introduced in Pennsylvania recently with obviously the best intentions would require trucks to have a minimum square inches of brake drum space. But the trend is in the other direction and brake drums are actually getting smaller with the emphasis on quality of materials.

Seven Against Detroit . . . The industry is currently plagued with a rash of governor bills, probably brought on by horsepower publicity. The industry's arguments against speed governor bills have been stated too many times for repetition, but that doesn't stop their introduction.

When something new is added to a car, like tinted glass, for example, the auto industry turns to seven states that are admittedly the toughest to get something new approved. At the top is Massachusetts followed by New Jersey, Connecticut, California, Minnesota, Washington, and Pennsylvania. If the object meets the requirements of these states, its universal approval is almost automatic.

Promote New Lamp . . . At the present time, the industry is seeking approval of a new sealed beam headlamp which has been developed by lamp manufacturers in an engineering program coordinated by the auto industry's Engineering Advisory Committee. Briefly, it is improved mostly in the low beam range where increased highway congestion has made improvements advisable. This lamp is now in the process of gaining approval in states where legislation or approval by the motor vehicle administrator is required. It is hoped that this will be universal in time for 1955 cars.



The Automobile Manufacturers Assn. has one department that catalogs bills and notifies its member companies of items that can be of serious interest. The AMA does no lobbying with elected representatives, but does have committees that cooperate with state motor vehicle administrators.

Lighting Laws Frequent . . . More bills are concerned with tail or rear lighting than any other automotive feature. Directional signals, windshields, mufflers and potential safety features are others frequently covered.

Motor vehicle administrators in many states have great power and sometimes actually influence features before they really get too much public attention. A trend to illuminating license plates from the top might be traced to objections from northern states where heavy snow created an illumination problem.

There are hundreds of silly examples of proposed legislation, most of which, fortunately, don't get very far. A recent one was a bill requiring a visual and audible signal (some sort of a "beep-beep" effect probably) to notify the driver if his stop lights aren't working. Next step presumably would have been another signal to warn when the warning light was out.

Wait And See . . . More than a year ago, W. E. Fish, Chevrolet's sales manager, made a prophetic

statement. At the Chevvy 1953 model introduction, he chided some of the opposition, particularly on sales boasting, and concluded:

"We'll just saw wood, then look at the results."

Well, the results are in and his prediction proved to be true. It is true that Chevrolet did its own sales boasting, but by and large it was much more restrained than Ford's, which reported gains here, leadership there, and trends that indicated a serious challenge for the top sales position.

Still On Top . . . But when the totals were added up, figures showed that Chevrolet not only outproduced Ford, but outgained it as well in the market.

According to *Automotive News* figures, Chevrolet sold 1,342,480 cars in 1953 for 23.39 pct of the market, a gain of 2.89 pct. Ford sold 1,116,267 cars for 19.45 pct of the market. This represented a gain of 1.83 percentage points, but less than Chevrolet's.

Industry-wide, General Motors divisions sold 45.07 pct of the U. S. market, a gain of 3.34 pct. Ford Motor Co. divisions got 25.14 pct of the market, an increase of 2.35 pct. Chrysler slipped to 20.3 pct, a slight drop of 0.98 pct. Independents and foreign cars altogether constituted less than 10 pct of all cars sold.

Stress Building of Sales Force

Throughout the auto industry, Studebaker officials are noted for their frankness. Last week C. K. Whittaker, vice-president in charge of sales, gave some of his views on the current auto market as related to the South Bend independent.

"I don't know that we will make a lot of money this year," he said. "Our No. 1 objective is to bring through a strong sales organization." While he explained that Studebaker has not lost sight of profits and fully intends to make money, he stressed the importance in the current competitive market of a strong sales organization.

"Our first step is to gear production to the capabilities of our dealers' retail ability," he said in commenting on abolishing second shift operations and a full week shutdown for dealer inventory correction.

In spite of this conservative production approach, Mr. Whittaker expects Studebaker to pick up about 4 pct of the market in 1954 as against about 2.8 pct last year.

Packard Moving Into Jet Plant

Another plant originally intended for defense use will end up in auto manufacturing when Packard moves its engine, automatic transmission, and axle operations to a new 1-million-sq-ft plant north of Detroit.

It will be the largest move in the company's 55-year history and will amount to a $47 million expansion for Packard. This includes millions in new automatic machine tools. Many of these will probably be incorporated into production of a new V-8 for 1955.

The plant was originally constructed for jet engine production and some jet engine operations.

The move indicates that, while Packard may be available for mergers, it will still continue on the long range program outlined by President James J. Nance for the production of its usual line of quality cars.

Automotive Production

(U. S. and Canada Combined)

WEEK ENDING	CARS	TRUCKS
Feb. 13, 1954..	117,057*	23,541*
Feb. 6, 1954..	117,114	21,837
Feb. 14, 1953..	122,781	24,322
Feb. 7, 1953..	122,896	23,913

*Estimated. Source: *Ward's Reports*

Plastic Cars Aren't Cheaper

Plastic car bodies for sports cars are not being offered as a cheaper substitute for steel bodies. GM's Corvette is expected to sell on the Canadian market for $5000 and Kaiser-Willys' Darrin for around $5250. Gadgets help boost the price of these models. In contrast, Ford's all-steel Customline is marketed for $2312.

THE BULL OF THE WOODS By J. R. Williams

OH, WE COULDA TOLD HIM THAT, BUT--
NO-NO-NO! IT WON'T WORK! WHEN YOU'RE THRU I'LL TELL YOU WHY!
THEM TWO BOSSES KNEW IT, TOO--BUT THEY HESITATE TO CORRECT TH' BIG BOY! WHAT'S EATIN' 'EM IS THEY GOT OUT OF TELLIN' HIM!
THAT'S A SPOT, BOY! HOW COULD THEY LET HIM KNOW THEY KNEW AS MUCH AS THIS GUY WITHOUT LETTIN' HIM SEE THEY KNOW MORE THAN HIM?
THE DIPLOMATS
2-19 J.R.WILLIAMS

use the oil that gives GREATER PROTECTION

HIGH PRESSURE, high temperature and water — those are the reasons why your back-up rolls must have effective oil film lubrication — *Texaco Regal Oil.*

Texaco Regal Oil is a turbine-quality heavy circulating oil especially developed for continuous rolling operations. It has outstanding stability and resistance to oxidation, emulsification and sludging — separates rapidly from water. *Texaco Regal Oil* thus keeps oil lines and bearings clean — assures trouble-free performance, longer bearing life and lower maintenance costs.

For enclosed reduction gears, *Texaco Meropa Lubricant* should be used. It retains its EP properties in severest service and has high resistance to oxidation, thickening and foaming.

Let a Texaco Lubrication Engineer help you improve performance and cut costs throughout your mill. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO Regal Oils

(HEAVY CIRCULATING OILS)

TUNE IN . . . METROPOLITAN OPERA radio broadcasts every Saturday afternoon. See newspaper for time and station.

Wilson Budget Gets 2-Party Salute

Little opposition expected to new defense budget . . . "More for less" philosophy earns bipartisan approval . . . Surveys show public wants less spending—*By G. H. Baker.*

There will be a minimum of haggling over the new (fiscal 1955) military budget in the weeks ahead. Congressmen of both parties are just about convinced that the budget prepared by the Pentagon and endorsed by the White House is a "tight" budget.

Defense Secretary Wilson points out that his department has now moved away from the "crash program" approach that characterized military procurement at the outbreak of the Korean war.

In its place is a long-haul defense program designed to keep the U. S. strong in what Mr. Wilson calls "an age of peril"—and on a continuing basis.

Earn Bipartisan Support . . . The White House today is in the fortunate position of being able to count on strong bipartisan support within Congress on defense and procurement matters. This position has not been reached easily. It has been built up slowly over the past year and is due largely to hard-won approval of the Wilson-Kyes "more defense at lower cost" management.

Democrats in both the Senate and the House now are ready to accept the Defense Dept. "new look" military program. This time a year ago, many Democrats bitterly attacked President Eisenhower's proposed cuts in military spending in the mistaken belief that the public opposed any reduction in armament spending. They were wrong. Public opinion polls show that the voters think military spending has been running far out of proportion to value received.

Boost Business Studies . . . More and better business guideposts are in the making. Anticipated increases in operating funds for the 1-year-old Office of Distribution are to permit Secretary of Commerce Sinclair Weeks to offer a strong and vigorous new advisory service—one that can speak with authority in business and industrial planning circles.

Secretary Weeks hopes Congress will appropriate at least $125,000 for Office of Distribution's new fiscal year. (This year it received $100,000, had a payroll of only 11 persons.) If Congress approves the expansion plans, Secretary Weeks and Office of Distribution Director Harry W. Ketcham are ready to launch detailed studies of new market potentials for U. S. industry.

Help Small Firms . . . Mr. Weeks and Mr. Ketcham are not concerned with market studies for larger firms. "They've got their own marketing and research people," Mr. Weeks says. What he and Mr. Ketcham are concerned with are the smaller firms not in a position to plot shifts in markets and to ferret out the possibilities for new products.

If present plans go through, Office of Distribution will issue within the next few weeks its first "Distribution Data Guide" for industry. This guide will present a complete list of all available reports covering various phases of distribution—what's available in the way of advice and where to find it.

South Still Sore . . . Loud protest from southern cities and states forced cancellation of a tentative congressional decision to tax "industrial development" bonds, but industry-hungry sections of the South are not pleased by the new ruling which replaced the cancelled regulation.

The tax-writing House Ways & Means Committee had decided unofficially to tax the interest on development bonds. This was a move designed to shut off the migration of business and industry to southern states and cities. In many areas of the South, cities and states have built plants with the revenue from tax-free bond issues, and have then leased the facilities to business firms at nominal rentals.

Under the revised approach to the problem adopted last week, cities and states may issue tax-free bonds, but the firms benefitting from them may not deduct rent as a business expense. At the present time, rent or lease payments are legitimate deductions. Southern congressmen are not too happy about the revised arrangement, but there appears to be little that they can do about it for the time being.

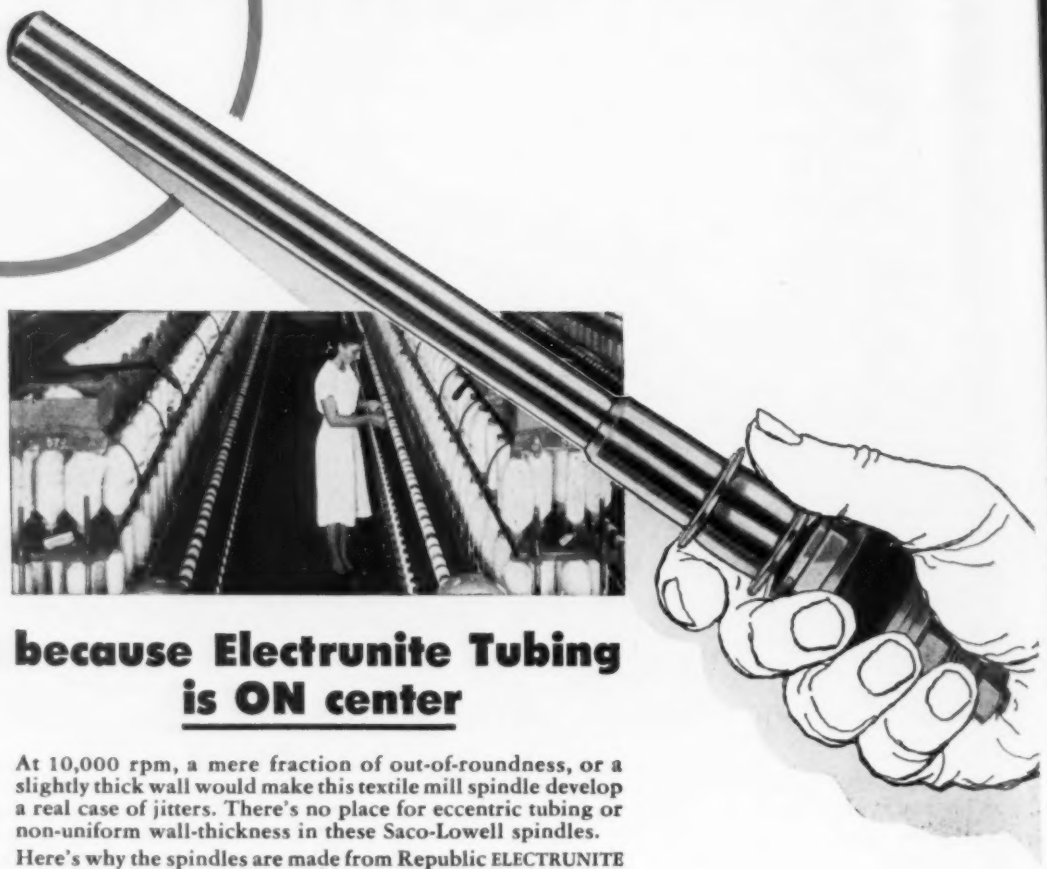
Raise Highway Aid . . . White House support is now behind a congressional move to boost federally-aided highway construction

Set New Titanium Goal

New federal action offering fast tax writeoff benefits in 22 industrial lines opens new goals for expansion of titanium melting operations and various transportation facilities. Interim goal calls for titanium melting capacity of 37,500 net tons by 1956. Industry now has melting capacity of less than 8000 tons per year.

Among 90 goals still open for expansion are those for military planes and ordnance. Since 1950, the government has approved tax amortization for more than 18,000 facilities, estimated to cost $29.2 billion. About $17.5 billion of this has been approved for rapid write-off.

10,000 smooth RPM on 25% less power . . .



because Electrunite Tubing is ON center

At 10,000 rpm, a mere fraction of out-of-roundness, or a slightly thick wall would make this textile mill spindle develop a real case of jitters. There's no place for eccentric tubing or non-uniform wall-thickness in these Saco-Lowell spindles.

Here's why the spindles are made from Republic ELECTRUNITE Steel Tubing . . .

Uniform wall thickness and concentricity are assured by the way ELECTRUNITE Steel Tubing is made. The carefully rolled flat steel is inspected on both sides. Then it's formed on precision rolls into a cylindrical shape that's electric resistance welded to make a uniformly strong tube.

The tubes are uniform in every dimension, every contour. They can be fabricated uniformly to produce these spindles that must turn at 10,000 rpm.

One thing more . . . uniformity and concentricity contributed greatly to the development of ball-bearing spindles that cut textile mill power bills as much as 25%.

Probably you have products that would be better or cheaper or longer lasting if you made them from Republic ELECTRUNITE Steel Tubing. We'd like to help you investigate the possibilities.

STEEL AND TUBES DIVISION
REPUBLIC STEEL CORPORATION
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Made By The Producers of
ELECTRUNITE—The Original Electric Welded Boiler Tube

Republic
REPUBLIC STEEL
ELECTRUNITE TUBING

by nearly $500 million per year.

But there's a joker in the hand: The highway program and its presidential support are based largely on the assumption that Congress will vote to retain the present 2¢-a-gallon federal motor fuel tax.

Rep. J. Harry McGregor, R., Ohio, is sponsor of the bill. It would increase annual federal funds granted to states on a matching basis from $575 million to $865 million.

Some $65 million, however, would go specifically for forest roads and work on the Inter-American Highway—leaving an increase of $225 million to be matched by the states.

Almost all of the increase would be allotted to the so-called interstate highways. Under present legislation, no more than $25 million a year can be allotted to the states for this purpose.

If the 2¢-a-gallon highway fuel tax is retained, Rep. McGregor estimates, revenue returned should run to about $910 million, just a little more than enough to finance the program.

What They Earned . . . Government revenues received from mineral leases on lands operated by U. S. Interior Dept. Land Management Bureau amounted to more than $49 million in 1953.

Oil and gas leases return most of the revenue. There are 79,000 oil and gas leases in connection with 60 million acres.

Share of 22 states and Alaska totaled more than $17 million. Royalties showed an upturn during the last half 1953.

'52 Water Commerce Next Highest

New figures on U. S. waterborne commerce during 1952 show several ports are waging a close battle for second place in the amount of tonnage received.

Overall national total for the year was 887 million tons, second only to 1951's record 924 million tons. Greatest individual volume was handled by the Port of New York, with 140 million tons. Houston was next with 46.6 million.

Closely grouped behind Houston were Baltimore 40.7 million tons; New Orleans, 39.5 million; and Philadelphia, 38.3 million.

Leading Great Lakes ports in freight traffic handled were Duluth-Superior, with 63 million tons; Chicago, 29.9 million; and Toledo, 28.6 million.

More than 168 billion ton-miles of freight moved on the inland waterways in 1952. The Great Lakes, with nearly 105 billion, and the Mississippi system, with 37 billion, were leading traffic routes.

State Taxes:

Supreme Court rules on when firms don't have to pay.

U. S. Supreme Court recently handed down two decisions affecting state taxes on firms working for the government.

In the first it ruled that General Electric Co. will not have to pay the State of Washington a business and occupation tax which would have amounted to more than $2.2 million for operating the government-owned atomic energy plant at Richland, Wash., since 1946.

This decision reversed a previous state court ruling.

Both GE and the U. S. Justice Dept. had appealed the earlier decision. The latter cited the Atomic Energy Act of 1946, stating that property, income, and activities of the Atomic Energy Commission are exempt from state, county, and municipal taxation.

However, Justice Dept. noted that Congress recently repealed the effect of the exemption after Oct. 1, 1953. Washington State may be able to collect its business and occupation levy from that date on.

In the other decision, U. S. Supreme Court ruled that sales of equipment to contractors operating as purchasing agents for the federal government are not subject to state tax.

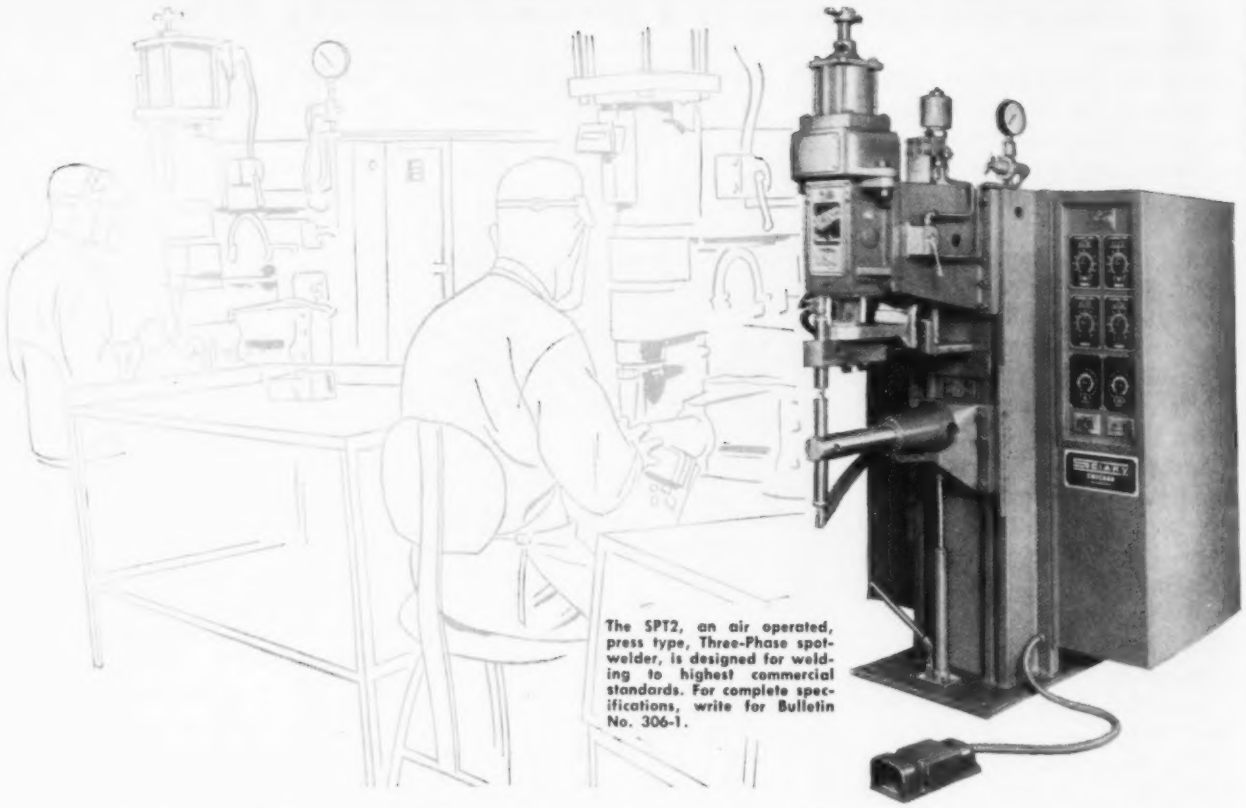
In a 6-3 decision last week the Court decided in favor of Kern-Limerick, Inc., Little Rock, Ark., and a group of contracting firms which formerly worked on the naval ammunition depot at Shumaker, Ark.

In 1950, the Little Rock firm sold two diesel tractors for $17,000 to the contractors. Arkansas levied a tax of $342.93 on the sale, and Kern-Limerick paid under protest, demanding a refund.

The Arkansas Supreme Court held that the sale was to the contractors, then working under a cost-plus-fixed-fee contract, and not to the government. However, the federal government intervened on the side of the seller.

FIVE NEW air bases and eight old ones are slated to be opened starting July 1 to meet Air Force's planned expansion to 137 wings.

YOU CAN USE
STANDARD SPOT WELDERS
FOR SPECIAL APPLICATIONS



The SPT2, an air operated, press type, Three-Phase spot-welder, is designed for welding to highest commercial standards. For complete specifications, write for Bulletin No. 306-1.

Three Standard Sciaky Three-Phase Machines Simplify Complications of Welding Bumper Guards

Grand Rapids Metalcraft, a Division of F. L. Jacobs Co., consulted Sciaky about special machines for resistance welding two mounting brackets in automobile bumper guards. Definite requirements of strength, outside appearance, and production were complicated by limited power facilities.

After careful examination of the problems, Sciaky engineers adapted completely standard spot welders with simple tooling.

Sciaky patented Three-Phase Principle of operation with balanced line load, near unity power factor, and reduced KVA demand readily satisfied limited power facilities, where conventional single phase would not.

Not only did the strength of spotwelded assembly exceed requirements, but Sciaky Three-Phase operation eliminated need for special metal finishing.

Compared to previous method of arc welding, production soared . . . a fraction of the equipment and floor space was needed . . . three unskilled workers replaced many highly skilled men . . .

Write for the complete story of Grand Rapids Metalcraft's use of standard Sciaky welders for this job. Ask for "Resistance Welding at Work," Volume 3, No. 8.

Largest Manufacturers of Electric Resistance Welding Machines in the World

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Ordnance Makers See Dim Days Ahead

Value of ordnance orders in San Francisco area has dropped $50 million since last June . . . Government stockpiles mounting . . . Equipment makers fare better—*By T. M. Rohan.*

Western ordnance makers, going somewhat slower than last year, still represent a good share of western metalworking. But they face a cloudy future.

The San Francisco Army Ordnance District last week said orders in its area including Seattle, Portland and Spokane total $450 million, about $115 million of it placed last year. In June last year the total was $500 million and 2 years ago $470 million. During 1953 output of finished products hit $127 million, or about 90,000 tons.

Future Uncertain . . . But munitions makers are getting close to the end of the line as government stockpiles mount and expenditures are cut. The large shell case plant at Riverbank, Calif., operated by Norris-Thermador Corp., Los Angeles, with 1100 employees, is currently running only four of its seven lines on 105 mm Army cases and 3 and 5 in. Navy cases.

A company spokesman said last week, "Our present contracts run only through May and there's no business in sight after that. We've been this close to the end of the rope before, but there was always new business in prospect."

Rheem Mfg. Co., San Pablo, Calif., a major projectile producer, said its contracts run about the same time.

Equipment producers such as Food Machinery & Chemical Corp. at San Jose, Calif., are faring better. This firm is in steady production on the M59AIV armored infantry personnel carrier.

New Aluminum Mill? . . . Kaiser Aluminum's plans for a new Midwest sheet mill, under discussion for 2 years, last week appeared to be gaining renewed attention. Major impetus was heavy output from Chalmette, La., reduction mill now at near-capacity operation resulting in some shortness of finishing facilities.

Indications are the new mill will be about half the size of the Trentwood, Wash., mill or about 7.5 million tons, with space for doubling capacity. Preliminary bid requests were put out in January and are expected to be submitted to the board of directors Apr. 2.

A certificate of necessity application 2 years ago indicated plans for a mill in Ohio although other Midwest sites are reportedly under option hinging to a large extent on power availability and cost.

West's Capacity Slips . . . Rated steelmaking capacity in the seven western states last week showed a slip of 90,730 tons. Major drop was in Pacific States Steel Co. at Niles, Calif., which registered a drop of 116,230 tons.

The firm's three openhearths continue in operation and the four 25-ton electric furnaces have continued on standby the past year. Company officials feel the three openhearths should be rated at about 240,000 annual tons.

A second factor in the drop was absence of Seidelhuber Steel's electric capacity of 60,000 tons which has been inoperative most of the year pending a reorganization.

Geneva Increase . . . Major increase in capacity was U. S. Steel's Geneva Works which jumped 204,000 tons to new rating of 1.879 million tons based largely on all-time record 1953 output. U. S. Steel also had a minor drop of 6000 tons at its Pittsburg, Calif., mill due to end of use of leased facilities at an adjacent Defense Plants Corp. armor steel foundry.

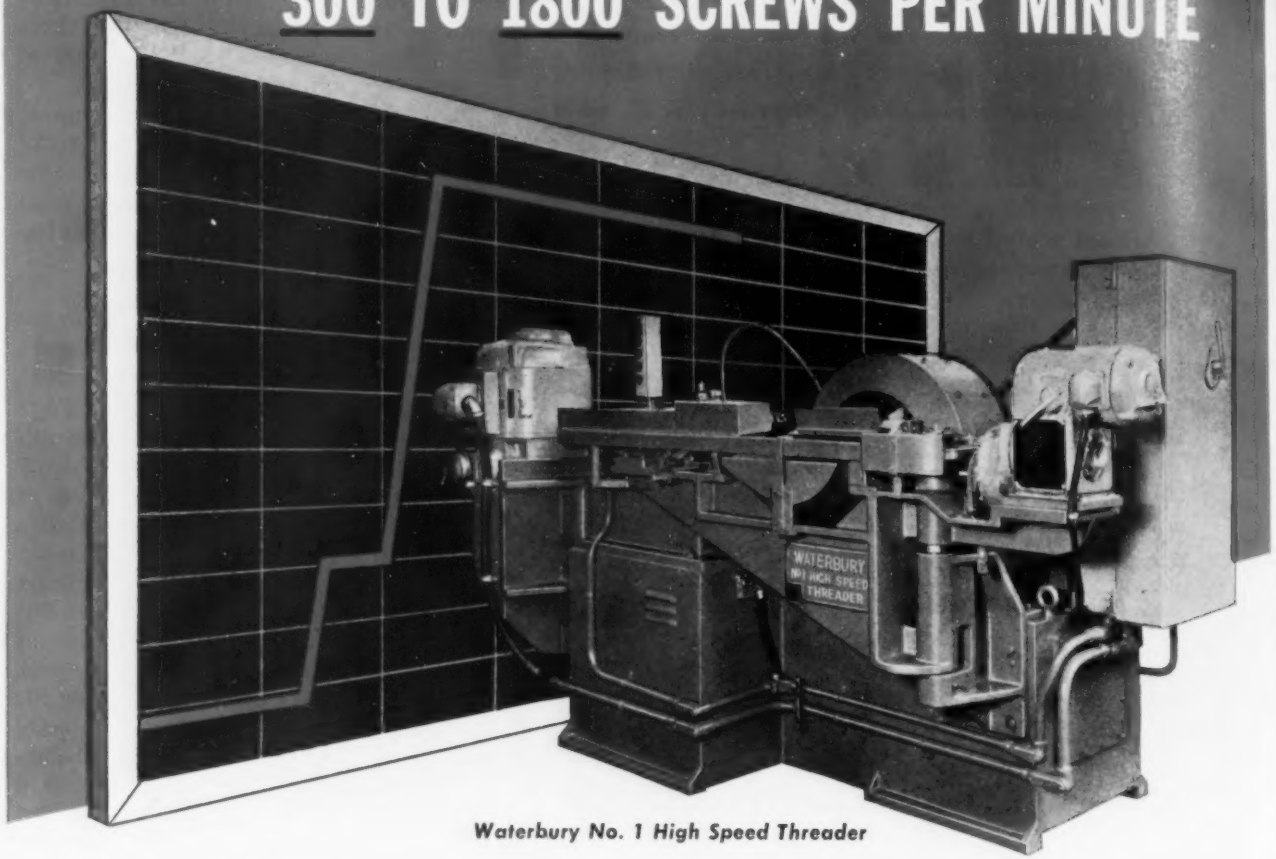
Combined with a gain of 10,000 tons at the Torrance, Calif., mill, U. S. Steel's total gain was 208,000 tons or 9 pct. Kaiser's major gain was a third blast furnace boosting pig iron rating from 876,000 to 1,314,000 annual tons.

In the overall IRON AGE Western District encompassing the 11 western states plus Texas and Oklahoma, total gain was 5 pct retaining its position nationally as No. 5 area at 8.8 million tons.

GOOD WILL tour of Benjamin Fairless and David McDonald hit Columbia-Geneva Steel Div.'s Pittsburg, Calif., Works recently. Shown (l to r) are: T. B. Henderson, president, USW Local 1440; Mr. McDonald; Mr. Fairless; A. J. Cerasani, president, Local 2571; J. D. McCall, general superintendent, Pittsburg Works.

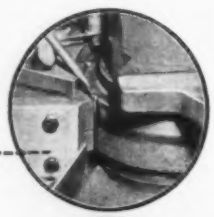
Another big Waterbury Farrel change in the screw production picture...

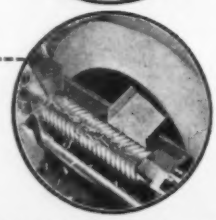
THIS NEW WF MACHINE THREADS 300 TO 1800 SCREWS PER MINUTE



Waterbury No. 1 High Speed Threader

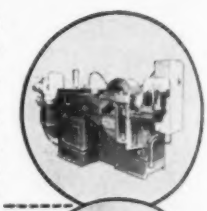
- Capacity: #6 to 1/4" machine screws—5/16" to 3" long—Steel, brass and other alloys.
- New Planetary Die principle threads from 5 to 30 blanks every second.
- Steel belt and twin worm feed insures continuous supply of blanks.
- Vari-Drive unit provides variable thread rolling speeds.

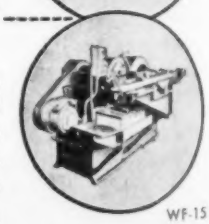




- Rugged construction protects alignment—gives long production life with low maintenance.
- Waterbury High Speed Threader and Waterbury High Speed Slotter (500 to 2000 per min.) = an unbeatable screw production team.

Write for further details on this outstanding new thread roller. Complete information also available on the Waterbury High Speed Slotter or on any other Waterbury machine.





WF-15

Patents by Victor Fray of New Zealand—Built and Sold by Waterbury Farrel in U.S.A. and Canada Only.

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FOUNDED WATERBURY FARREL 1851

Builders Fear Germany's Strength

Industry tells government its worries about foreign competition . . . Some builders want high tariffs, restrictions on use of U. S. financial aid—By E. J. Egan, Jr.

West German machine tool industry, heavily financed since World War II by U. S. dollars, has grown at a surprising rate. American builders estimate it is twice as large as their own industry and employs twice as many people.

U. S. builders are worried about this rapid growth, said so at a recent meeting in Washington between Business & Defense Services Administration officials and a machine tool industry advisory group.

Won't Be Solved . . . Main worry involves U. S. imports and exports of metalworking equipment. There have been too many foreign machines imported, and too few American machines exported in recent years, according to industry spokesmen. But having stated their concern to government officials, builders admit the problem won't be solved easily, and they are aware of political aspects of the problem.

Some builders say a very high tariff barrier would be the ideal way to shut off imports of lower priced foreign tools. They also suggest that regulations specifying that U. S. funds sent abroad be used to buy American machine tools would aid the domestic export situation.

Under such a setup, U. S. machine tool builders would be in an advantageous position, but no one in the industry expects that any such sweeping favors will be granted by the government. They do intimate that a few steps in the "right" directions would be very welcome, indeed.

Long Way to Go . . . But the tariff situation seems a long way from settlement at the moment. Builders aren't nearly so hopeful of relief in this direction as they are from other areas of government influence.

Most important of these right now are: (1) New tax legislation to allow rapid depreciation allowances for machine tool buyers, (2) settlement of long-standing headaches on renegotiation of defense contracts, (3) assurance of an unyielding stand by the government against leasing its machine tools for non-defense work.

Will Keep Pressuring . . . Liberalized depreciation allowances are expected to be written into law this year, but builders intend to apply constant pressure on Congress right up to the moment President Eisenhower signs the new omnibus tax bill.

The renegotiation problem hangs on and on, but here again builders will keep plugging for final settlements as soon as possible.

Despite the contention of Office of Defense Mobilization and Defense Dept. officials that no government-owned machine tools will be leased for non-defense purposes, builders do not intend to relax their vigilance. Too many fringe cases seem to be coming up for decision, and apparently the decisions against leasing are not coming fast enough or firmly enough to satisfy the industry.

"I think maybe we should get a bit lower grade steel for those fittings."

Work on Directory . . . Defense Dept. is planning to publish a new, up-to-date Directory of Metalworking Machinery. They'd like to make it as complete as possible before it goes to press and want to hear from machine tool and metalforming equipment manufacturers not now on the department's questionnaire mailing list.

Listings will be confined to machine tools matching Federal Standard Commodity Classifications 3411 through 3419, and metalforming equipment to match classifications 3441 through 3449. Manufacturers wanting more information about these listings are urged to write: Assistant Secretary of Defense, Supply & Logistics, Production Equipment Branch, Washington, 25, D. C.

Business Is Brisk . . . Gage manufacturers busy developing new applications for inprocess systems of quality control complain their catalogs go out of date as fast as they're printed. But this means continued good business for them, all they can handle for a year or more.

Their big headache is to find and train enough personnel with the potential skills required for precision manufacturing.

How Designs Develop . . . A new institutional-technical movie, *The Turning Point*, has recently been produced by Monarch Machine Tool Co., Sidney, Ohio.

The 16-mm, color-sound film does not take the viewer on the usual plant tour. Instead, it shows how new equipment designs are developed and pictures quality control methods utilized to build a complete line of modern lathes.

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BIG IN CAPACITY. BIG IN EFFICIENCY. BIG IN EARNING POWER.

Hauling up to 24 cubic yards, only these Macks deliver so many specific working advantages to big yardage strip-mine operators.

A fast cycle from shovel to tipple or dump, assured by the high maneuverability of Mack dumper design and the easy control of power-steering.

All-weather operation regardless of terrain because Mack six-wheelers have the famous Balanced Bogie that won't bog down. Only Mack offers the exclusive Power Divider which distributes torque between bogie axles in proportion to traction, pulls through where ordinary trucks mire in.

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Mack TRUCKS

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REPORT TO MANAGEMENT . .

Who's to blame?

What's causing the current "rolling readjustment"? It's hard to finger a single culprit but most of the evidence points to inventory cutbacks.

Last fall supplies eased, deliveries quickened and there was a gentle transition to a buyer's market. To adjust, retailers began selling from the shelf and manufacturers started filling orders from stock.

With consumer demand holding near peak levels and experted to continue this way, the live-off-inventory trend will have to stop. Each dip in inventories brings nearer the day when business and industry will have to start buying again.

And inventories are dropping. Dept. of Commerce figures show a decline for the third straight month, as December stocks slipped $2.5 billion from November levels.

Bruise nails on bottom

Even steel sees signs some of its customers are now scraping inventory bottom. In a few cases orders have been placed for increased tonnage, and some delivery dates have been moved up.

But don't expect this trend to hit all industries at once. Inventory positions vary greatly. Watch for different industries to come back as customers one by one over the next few months.

Detroit turns it off and on

Auto trends are more confused than ever. Despite layoffs, shutdowns, carmakers are still producing at a rate that would make 1954 the fourth, perhaps third, best year in history.

Ford output in January was 48.9 pct ahead of same month last year; GM was up 2.4 pct; Studebaker, 95.4 pct (had strike, production problems last January). All others were trailing '53.

Color in the living room

Sign of aggressive sales thinking is the way a TV-maker is trying to sidestep the color trap. Crosley last week came out with a lightweight, low-cost portable black-and-white unit (17 in.). It's for use in "other rooms" when a color job takes over the living room.

Add smart sellers: Reynolds Metals Co. and Hotpoint, Inc. New Hotpoint refrigerator has built-in aluminum foil dispenser. Roll of Reynolds Wrap comes with it.

Sorry we're not dead

It's from a usually unreliable source (Moscow), but Russia's leading economist, Eugene Varga, has revised his prediction of a few months ago that the U. S. is careening into a major depression. He's upset about the slowness of our economic crackup, thinks production may even increase somewhat during the next few months.

His views are important since Soviet policy is sometimes based on his forecasts.

HE has it...

the thing you want!

NO NEED to search through directories or ask people about it. When you need a finished bearing, a bar of bearing bronze or any other one of countless items of industrial materials and equipment, just phone your industrial distributor.

YOUR BUNTING distributor is the leading industrial distributor, or a stock-carrying specialist in certain industrial items. With money-saving convenience, he can supply hundreds of different sizes of completely machined and finished Bunting Standard Stock Industrial Bearings, Electric Motor Bearings and Precision Bronze Bars.

Ask him for a Bunting Catalog which gives complete dimensional and technical data.

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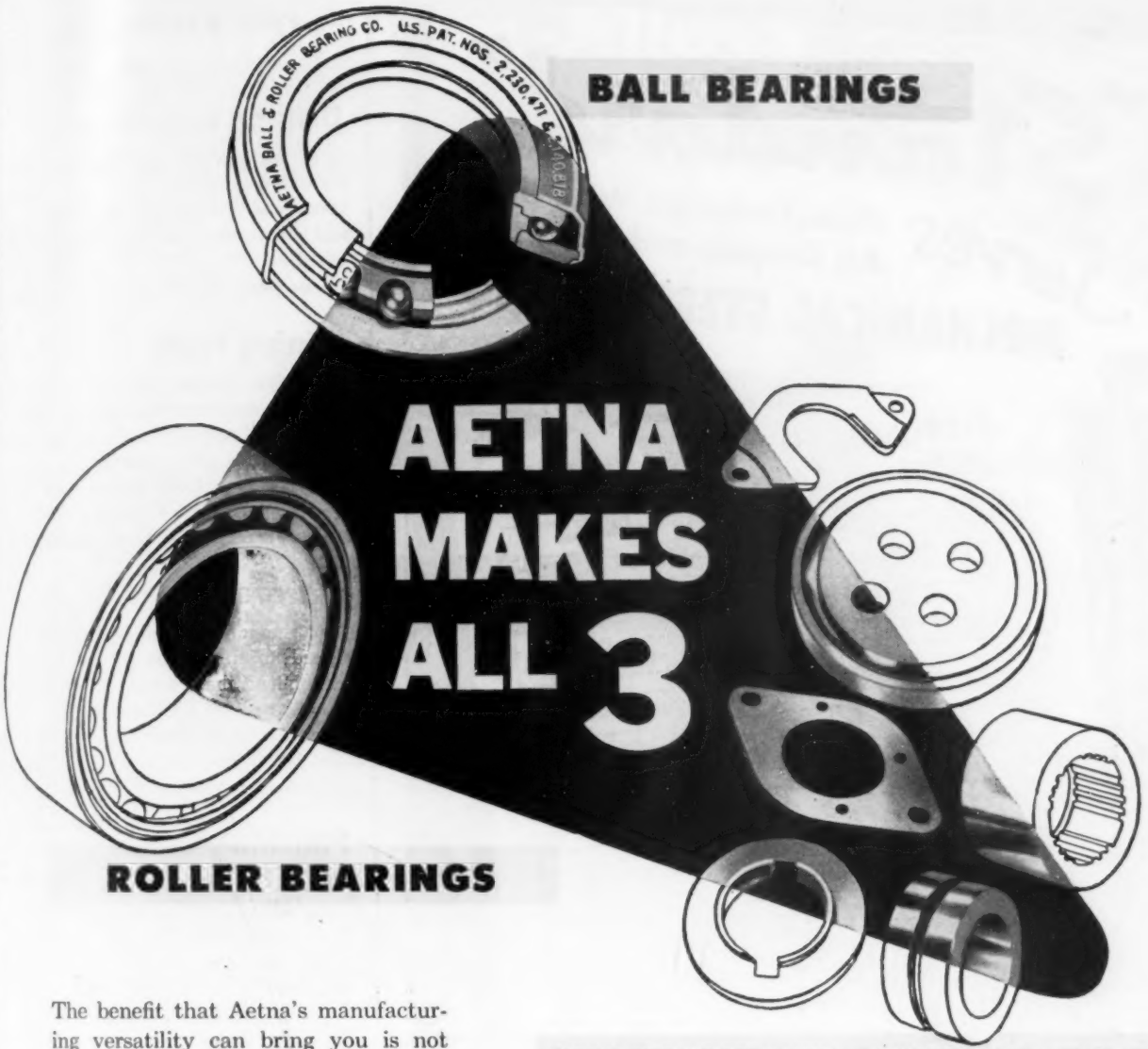

The benefit that Aetna's manufacturing versatility can bring you is not fancy, but fact—proved by the experience of the nation's leading manufacturers in the automotive, farm implement, oil drilling equipment and general industrial fields.

If your product calls for ball bearings, roller bearings or hard-to-make precision parts just remember Aetna can supply them all . . . in the volume you need . . . to your most exacting metallurgical and precision specifications. And when you deal with Aetna you draw on a 38-year background of engineering knowledge and production experience hard to match anywhere. A letter or phone call will place our engineers at your disposal.

AETNA BALL AND ROLLER BEARING COMPANY
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38 YEARS OF *Quality*
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Standard and Special Ball Thrust Bearings • Angular Contact Ball Bearings • Special Roller Bearings • Ball Retainers • Hardened and Ground Washers • Sleeves • Bushings • Miscellaneous Precision Parts

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Serves Manufacturers Who Use All Shapes and Sizes of

MECHANICAL STEEL TUBING

SIZE AND THICKNESS CHART

of Electric Weld Tubing for Mechanical Use

TUBE DIAMETER "O.D. SIZE	MAXIMUM WALL		MINIMUM WALL	
	DECIMAL	B. W. GAUGE	DECIMAL	B. W. GAUGE
1/2"	.065"	16	.028"	22
5/8"	.065"	16	.028"	22
3/4"	.065"	16	.028"	22
7/8"	.083"	14	.028"	22
1"	.109"	12	.028"	22
1-1/8"	.109"	12	.028"	22
1-1/4"	.134"	10	.028"	22
1-3/8"	.134"	10	.028"	22
1-1/2"	.148"	9	.035"	20
1-5/8"	.148"	9	.035"	20
1-3/4"	.148"	9	.035"	20
1-7/8"	.165"	8	.035"	20
2"	.165"	8	.035"	20
2-1/4"	.180"	8	.035"	20
2-1/2"	.203"	7	.035"	20
2-3/4"	.203"	6	.035"	20
3"	.220"	6	.049"	20
3-1/4"	.220"	5	.049"	18
3-1/2"	.238"	5	.049"	18
3-3/4"	.238"	4	.049"	18
3-7/8"	.238"	4	.049"	18
4"	.238"	4	.049"	18
4-1/4"	.250"	4	.049"	18
4-1/2"	.250"	3	.065"	18
4-3/4"	.250"	3	.083"	16
5"	.180"	3	.083"	14
5-1/2"	.180"	7	.083"	14
		7	.083"	14

*Intermediate sizes within the range indicated can also be manufactured. Please consult us for sizes not listed.

Manufacturers requiring tubing for civilian or defense production prefer "Standard's" Electric Weld Steel Tubing for many reasons! "Standard's" Electric Weld is produced in one of the most versatile and complete mills of its kind in the world. "Standard's" 33 years of specialized tubing "know-how", and monthly production of millions of feet of stainless and carbon steel tubing, in wide range of sizes and gauges, assure you of utmost satisfaction. No problem of tolerance, precision or severest application for mechanical, structural, or pressure tubing is too difficult.

STAINLESS STEEL TUBING
¼" to 6½" O.D. . . .020 to .134 wall

ABOVE CHART COVERS ROUND CARBON STEEL TUBING . . .

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EQUIVALENT SQUARES, RECTANGULARS AND SPECIAL SHAPES ARE ALSO AVAILABLE.

—Free Publications—

Continued

Drilling machine

New bulletin is now available on Hamilton varimatic super sensitive, small hole drilling machine. Diagrams and illustrations are included. *Hamilton Tool Co.*

For more data circle No. 15 on postcard, p. 109.

Mining tools

Four new mining tools are included in latest supplement to mining catalog issued by Carboloy. Catalog describes tool features and specifications of importance to mining people. *Carboloy Dept. of General Electric Co.*

For more data circle No. 16 on postcard, p. 109.

Motors

New line of integral hp motors, designed specifically to provide smooth, economical changeover to new standards prescribed by National Electrical Manufacturers Assn. is described in new literature. *A. O. Smith Corp.*

For more data circle No. 17 on postcard, p. 109.

Finishing

Information on Metals Finishing Corp.'s *Duplex* is given in new release from company. Machine is designed for deburring, cutting down, high-lustre burnishing and a wide variety of other finishing processes. *Metals Finishing Corp.*

For more data circle No. 18 on postcard, p. 109.

Cam switch

Danly Rotary Cam Limit Switch permits split second timing of control circuits during operation of the equipment. Fine adjustment of each cam is made by simply setting a thumbscrew on the outside of the housing. Comprehensive data is included. *Danly Machine Specialties, Inc.*

For more data circle No. 19 on postcard, p. 109.

Clad metals

An Introduction to Clad Metals, publication offering a comprehensive survey of the manufacture and applications of the stainless, copper, brass and other clad steels, has been released by Superior Steel Corp. The booklet is profusely illustrated and shows the basic equipment and processes used in the varied cladding methods attempted in the past as well as those now in production use. *Superior Steel Corp.*

For more data circle No. 20 on postcard, p. 109.

Vanadium-Alloys

announces

a new **FM** series

FREE MACHINING

of free-machining steels*

in the following important tool steel grades

HIGH SPEED STEELS

RED CUT SUPERIOR FM
VASCO SUPREME FM
NEATRO FM
VASCO M2 FM
8N2 FM
VAN-LOM FM

DIE STEELS

OHIO DIE FM
(air hardening, high carbon, high chromium)

CROCAR FM
(oil or air hardening, high carbon, high chromium)

SPEED CUT
(free machining die steel, produced since 1947)

For tool steel applications where *free machining* quality is desirable, we offer this new FM Series. Vanadium-Alloys FM steels machine more easily, permit better machined finish, and in certain instances show improved performance. To obtain free machining characteristics in the nationally-known steels listed above, simply specify the brand name desired, followed by the letters FM.

Complete information on our FM steels is available from your Vanadium-Alloys representative. Ask him for the facts.

*Several grades manufactured under U.S. Patent No. 2,204,283, Simonds Saw and Steel Co.

FIRST QUALITY TOOL STEELS

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STEEL COMPANY

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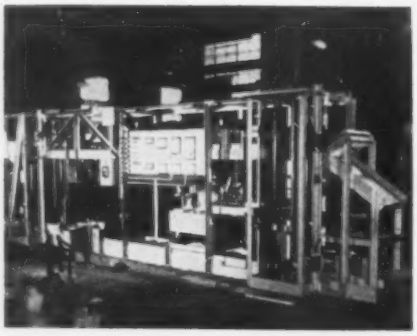
COLONIAL STEEL DIVISION • ANCHOR DRAWN STEEL CO.

NEW EQUIPMENT

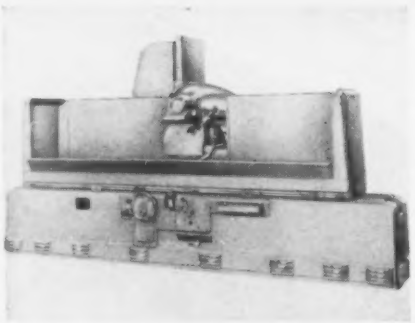
New and improved production ideas, equipment, services and methods described here offer production economies . . . just fill in and mail the postcard on page 109 or 110.



Tray-cast machine casts metals, plastics

The tray-cast machine is a production casting, molding or forming unit for materials such as melted ferrous or nonferrous metals, plastics, etc. It is a singular tray or mold type: trays or molds can be changed simply by removing them from the system and replacing with new molds or trays. The machine consists of one or more pouring stations and an arrangement of pushers and elevators which provide flexibility for pouring different types of molds at the same time. The machine can be built in capacities from 1000 to 10,000 lb per hr for aluminum casting, and higher for heavier metals. *Ferguson Equipment Corp.*

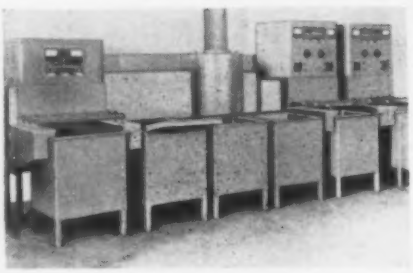
For more data circle No. 21 on postcard, p. 109.



Production surface grinders built in 37 sizes

Fast, accurate and economical grinding of parts from a tool steel broach bar to a machine tool way is claimed for a line of Type C production surface grinders. Sizes range from 12x48 in. to 24x168 in. Features include 20-in. diam wheel cross-feeding with horizontal spindle and grinding with periphery of wheel, power elevation and hydraulic rapid traverse with safety stops. Fast sparkout plus small increments of down feed at 100 fpm table speed provide high accuracy and quality finish. Motor is built into wheel head and mounted on spindle. *Thompson Grinder Co.*

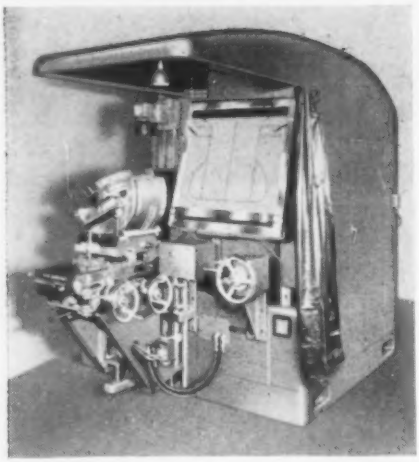
For more data circle No. 22 on postcard, p. 109.



On-the-spot chrome finishing of production tools

Features of the Morey Process for precision hard chrome plating are available to general industry in a packaged unit. It enables one to set up complete plating facilities for on-the-spot chrome finishing of production tools and parts. All equipment for the complete plating department is furnished: six tanks, lead and neoprene tank linings, five rectifiers, a fume separation system, heat and timing controls and electrical connections ready for immediate installation. *Wagner Brothers, Inc.*

For more data circle No. 23 on postcard, p. 109.



Inspection of slots in gas turbine discs

Slot contour, angular locations, and spacing on gas turbine discs from 12 to 36 in. diam can be inspected with a new optical comparator. For the convenience of the operator, the receiving screen is located at one side of the workholding fixture and positioned vertically at eye level. All controls are within easy reach of the operator. Vertical travel of the worktable is hydraulically operated with a Servo mechanism which gives finger tip control. The 30x30 in. receiving screen is of sufficient size to permit use of projection lenses of suitable area to encompass most slots at magnifications of 31.25 or 50 times size. Staging fixture with suitable sine bar arrangement is rigidly constructed for supporting heavy disks. It provides extremely accurate means for tilting the disc up to 50° either right or left for slot angle, 15° for face angle. *Jones & Lamson Machine Co.*

For more data circle No. 24 on postcard, p. 109.

Turn Page

SEE RUST-OLEUM APPLIED DIRECTLY OVER SOUND RUSTED SURFACES! MAKE THIS TEST UNDER YOUR OWN CONDITIONS AND SEE PROOF OF PERFORMANCE!

See Rust-Oleum 769 Damp-Proof Red Primer actually applied over a badly rusted surface after simple scraping and wire-brushing to remove rust scale and loose rust in the Rust-Oleum *"rusted panel demonstration."* Rust-Oleum's specially-processed fish oil vehicle *penetrates* rust to bare metal usually eliminating sandblasting and other costly surface preparations.

Rust-Oleum finish coatings in Aluminum, Green, White, Gray, Yellow, Black, Orange, Blue and others provide both *Rust Prevention* and *Decorative Beauty!* Specify Rust-Oleum for new construction, maintenance, and re-modeling. See Sweets for complete catalog and nearest Rust-Oleum Industrial Distributor, or attach coupon to your business letterhead.

RUST-OLEUM®

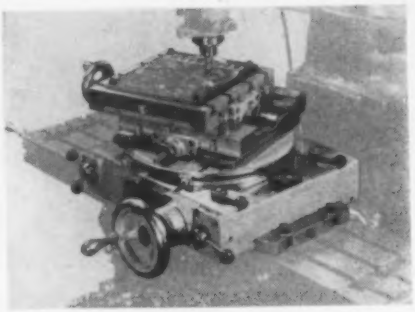
STOPS RUST!

There Is Only One Rust-Oleum. It Is Distinctive as Your Own Fingerprint. Resists Rain, Sun, Fumes, Snow, Heat, Salt Air, Salt Water, etc.

See local classified telephone directory under Rust Preventives or Paints for nearest Rust-Oleum Industrial Distributor.

ATTACH TO YOUR BUSINESS LETTERHEAD AND MAIL TO:
Rust-Oleum Corporation, 2562 Oakton St., Evanston, Ill.

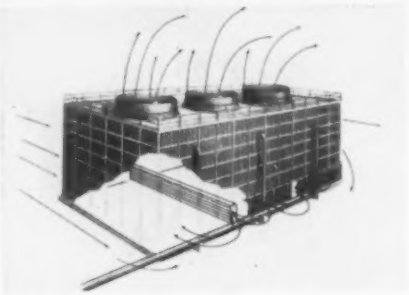
- ☐ Please Show Me the Rust-Oleum "Rusted Panel Demonstration."
- ☐ Test Application of Rust-Oleum Over Rusted Metal Surfaces in My Plant.
- ☐ Complete Literature with Color Chart.
- ☐ Nearest Rust-Oleum Industrial Distributor.



Setup time cut 50 to 90 pct with tool-die table

Highly detailed work may be performed accurately and economically on most standard vertical milling machines equipped with this new rotary type tool and die table. Setup time may be cut from 50 pct on simple jobs to as much as 90 pct on more complex jobs. The workpiece is located and clamped on the 11-in.-sq top cross slide, and is never moved until all work has been completed, regardless of the number of operations, radii, angles, etc., to be cut. Positioning of the workpiece from any point to another is accomplished accurately in a matter of seconds. *Advance Products.*

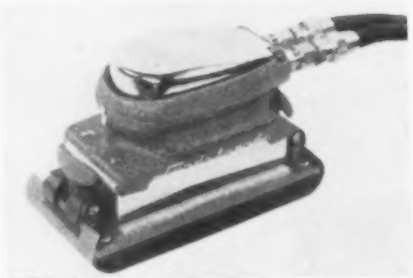
For more data circle No. 25 on postcard, p. 109.



New channel increases cooling tower performance

Significant progress toward the control of recirculation in cooling towers is found in a new engineering and design feature that uses equalizing channels between each cell of the tower. These balance pressure and reduce recirculation under all atmospheric conditions. During the presence of strong horizontal winds the channels allow air to pass completely through the tower in order to equalize pressure. Obstructions in the vicinity of the tower will not impede its performance. *Santa Fe Tank & Tower Co.*

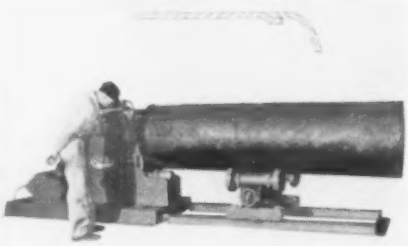
For more data circle No. 26 on postcard, p. 109.



Orbital sander speeds rough sanding jobs

Fast material removal is possible with the new orbital-type air sander. Speed of operation makes the sander suited for rough sanding and preliminary operations; it provides quick, economical make-ready for finer finishing where needed. It has built-in water attachment for wet sanding. The small, compact unit, weighing 4½ lb, fits snugly into the palm of the hand, is precision-constructed and counterbalanced to minimize vibration and reduce fatigue. *Sundstrand Machine Tool Co.*

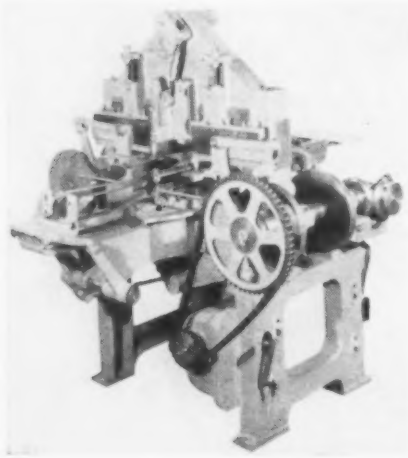
For more data circle No. 27 on postcard, p. 109.



Offset former has turntable for work rotation

Offset forming machines are used for joggling or offsetting the end of tank shells and pipes for subsequent assembly of welding heads or other shells. The joint thus produced provides an excellent backup for automatic welds and greatly facilitates assembly of the parts. Turntable permits rotation of the work; also permits rotating of the work end to end and movement of work into and out of the machine by means of the car type turntable with built-in rails and wheels. *Reed Engineering Co.*

For more data circle No. 28 on postcard, p. 109.



New machine forms tin container bodies

Latest addition to the Edwards' line of tin box making machines is the Model 20 automatic lock seam bodymaker. It not only forms container bodies to shape, but matches the seaming output of two or more side seaming machines, by producing 45 to 60 bodies per min, entirely automatically and uniformly. The operator merely feeds the blanks, notched if necessary, into the machine. Since all bodies are produced uniform and perfectly parallel, subsequent operations are simplified and speeded. Round, oval, irregular or square boxes can be produced on the machine, which lends itself readily to changes in diameter. A separate mandrel and shoe is required for each diameter. Standard machine handles sizes from 2 to 4½ in. diam; can be supplied for diameters down to 1½ in. Maximum body length is 8 in. Maximum blank length handled is 14½ in. *F. J. Edwards, Ltd.*

For more data circle No. 29 on postcard, p. 109.

Turn Page

HERE'S PROOF: You can always count on Continental for every fastener need!

All Continental Engineers Have Produced Precision Tools!

. . . to better meet *your* specifications

Every engineer at Continental has had experience producing ground thread taps and gages, with their exacting screw thread dimensions. This training with highest standards of precision is passed on to you in every Continental product. The superior accuracy and greater thread uniformity more than meet your specifications, but cost you no more.

Many times Continental cold forged fasteners have been substituted for expensive screw machine products, improving the product by increasing its strength, while reducing its cost.

Put these standards of precision to work for you. Call direct or contact your local Continental distributor today.

Manufacturers of **HOLTITE** Fastenings

CONTINENTAL SCREW COMPANY INC. 1904

50th Anniversary

CONTINENTAL SCREW COMPANY

New Bedford, Mass., U. S. A.

How to produce
strong, uniform welds
and save time doing it

Mine cars made of light weight low alloy, high strength steels mean bigger loads at savings in operating costs for mine owners. Strong, sound welds—able to resist the impact of loading, and the abrasion of filling and dumping also mean savings for the fabricator as well as additional savings in maintenance for the mine operator.

Because Arcos Low Hydrogen Electrodes can produce sound welds on a job like this, they can do the same thing for you on every *application* involving low alloy, high tensile steels. Whatever your requirements, there's an electrode to meet them. Rigid quality controls in manufacture assure you weld metal consistently high in quality and performance.

ARCOS GRADE	A. W. S. SPEC.
Tensilend 70	E7016
Tensilend 100	E10016
Tensilend 120	E12015
Manganend 1M	E9015
Manganend 2M	E10015
Nickend 2	E8015
Chromend 1M	E8015
Chromend 2M	E9015

Write today for "The ABC's of Welding High Tensile Steels".

Arcos Corporation, 1500 South 50th Street, Philadelphia 43, Pennsylvania

WELD WITH ARCOS
LOW HYDROGEN ELECTRODES

Paint stripper

Octastrip 33 removes a hitherto unstrippable vinyl enamel from phosphated aluminum without damage to the base metal. After immersion of the painted parts in a tank for one-half to one hour, the coating lifts off the metal in perfect sheet form. Very little brushing is required to remove any remaining traces. Simple washing after paint removal is said to leave the aluminum in a desirable, chemically passive condition. *Octagon Process Inc.*

For more data circle No. 30 on postcard, p. 109.

Fewer aisles needed

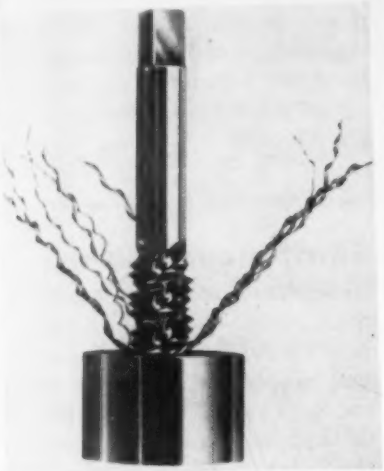
Fork extensions on Reach-Fork Trucks cut the number of aisles required and can reduce the width of each aisle. With these removable extensions many types of loads can be stacked four deep. The outside pallet load can be picked up or deposited in the conventional manner. The inside load can be reached by extending the forks through scissors type mechanism.

The truck can actually right angle stack loads up to 48 in. long from aisles only 72 in. wide—a reduction of 30 to 50 pct from conventional fork truck aisles. Other features include a full 2000 lb capacity at 24 in. load center, ability to handle multi-size pallets and ease of operation for loading and unloading box cars and trucks. *Raymond Corp.*

For more data circle No. 31 on postcard, p. 109.

Self-locking threads

Shearcutter Ever-Lock taps produce self-locking internal threads, and largely eliminate the use of bolts, nuts, lock nuts, cotter pins, and locking wires. They produce locking torques far in excess of any normal requirements in industry, it is reported. Manufactured to extremely close tolerances, they are produced in Class PG-II tap classes only, but are made to produce three classes of fits: snug, tight, and extra tight. With self-locking threads produced by the Ever-Lock tap, standard cap screws may be substituted for a bolt and the screw can be tightened to the proper degree for locking and holding by a power driven or hand operated torque wrench, insuring uniform locking and holding tension. *Ever-Lock Tap Co.*



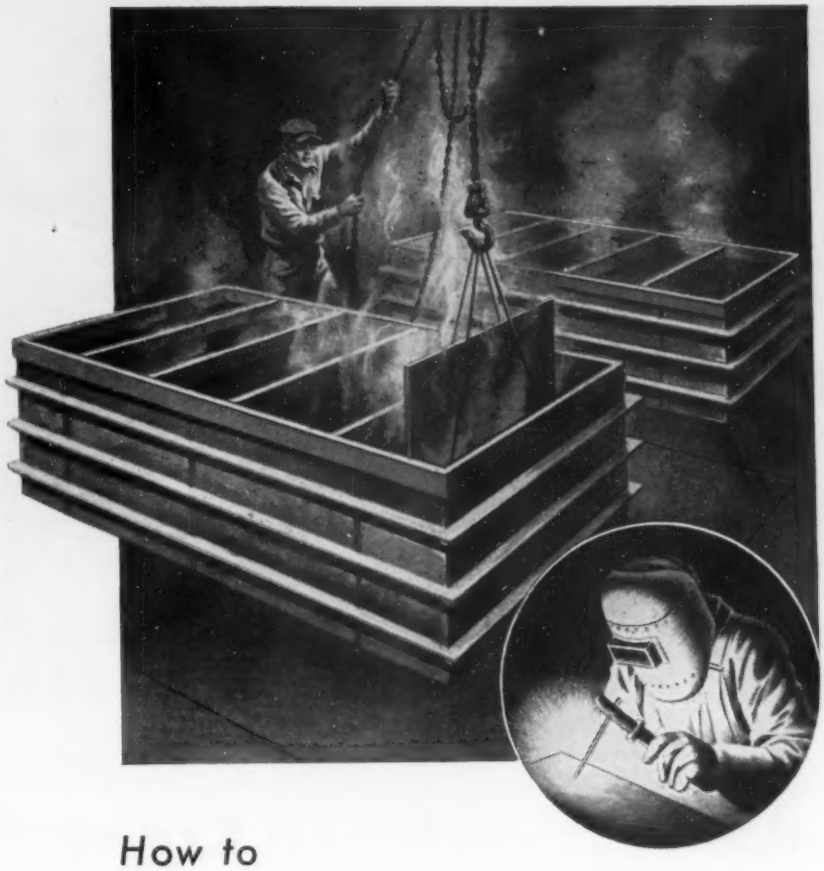
For more data circle No. 32 on postcard, p. 109.

Polishing head

A bantam weight Vonnegut portable polishing head for contour finishing of metal, wood, plastic or ceramic workpieces weighs just 2 lb. Featuring 12 brushes and 12 relatively narrow strips of abrasive, each 1½ in. wide, and a diameter of 6½ in., the head requires less power than larger 16 and 32 brush heads, permitting use of smaller power tools. A variety of adapters is made for applying the head to almost any type of small power tool up to 3500 rpm. *Grinding & Polishing Machinery Corp.*

For more data circle No. 33 on postcard, p. 109.

Turn Page



How to
tame corrosion fast and
effectively on welded joints

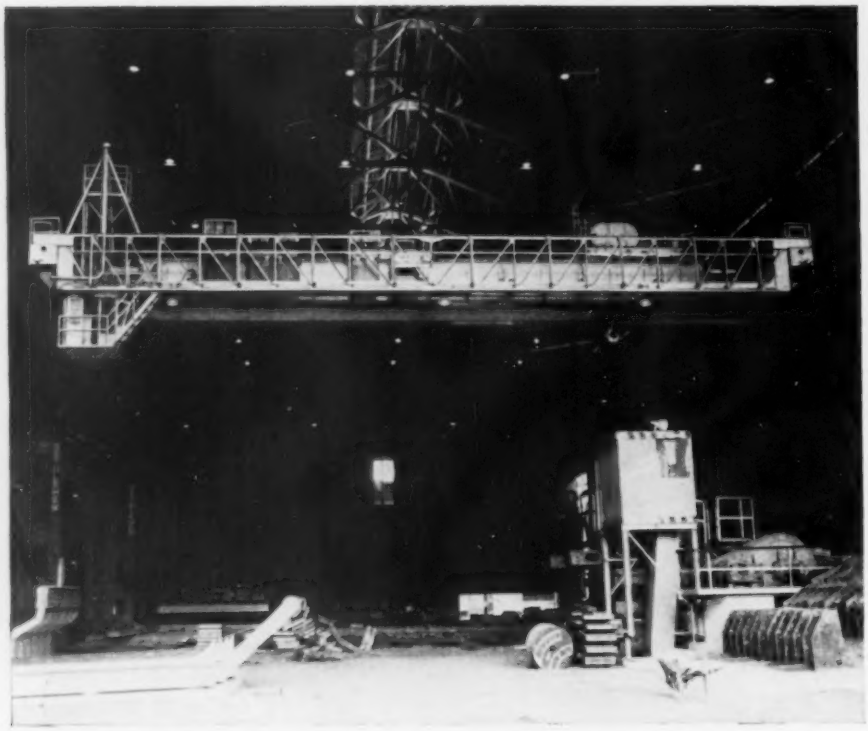
Chemical tanks and equipment must have more than the proverbial nine lives to withstand incessant corrosive attack.

Proper plate material and good joint design are basic. The choice of the right electrode in some cases may be relatively easy—but always highly important. In other cases, where the corrosive action is intensified by heat and perhaps pressure, the proper balance of the chemical, physical and metallurgical properties in the weld metal will be critical.

For every *stainless* job, whether it be relatively simple or critical . . . there's an Arcos quality-controlled electrode that will pay handsome dividends in sound trouble-free *weld metal.* Send for a free copy "What Electrode Would You Use?"

Arcos Corporation, 1500 South 50th St.
Philadelphia 43, Pennsylvania

WELD WITH ARCOS
STAINLESS ELECTRODES



25 ton Bedford Magnet Crane with 90 ft. span over the Blooming Mill Slab Yard in the new mill recently constructed by Detroit Steel Company at New Boston (Portsmouth), Ohio.

Another Bedford Crane for Detroit Steel

Proof of the superiority of Bedford Cranes is found in the high percentage of *repeat orders* from important owners through the years.

In steel mills, power plants, and throughout industry . . . wherever superior performance is *expected*, owners enthusiastically recommend Bedford Cranes.

Available in all types and sizes . . . from five tons to 350 tons and up . . . for all kinds of indoor and outdoor services . . . each Bedford Crane is individually engineered and precision built for its specific application.

Built to the most modern standards and backed by more than 50 years of specialized crane building *and utilization* experience . . . Bedford Cranes have won fame the world over for advanced design and for safe, smooth, dependable performance.

You are invited to consult a Bedford Engineer on your next crane problem . . . with all the facts on the table, we believe you too will make *your* next crane a Bedford.

(Write for complete catalog describing Bedford Cranes in detail.)

BEDFORD CRANES — SERVICE

STEEL MILL CRANES

BEDFORD

BEDFORD FOUNDRY & MACHINE COMPANY, INC. · BEDFORD, INDIANA

—New Equipment—

Continued

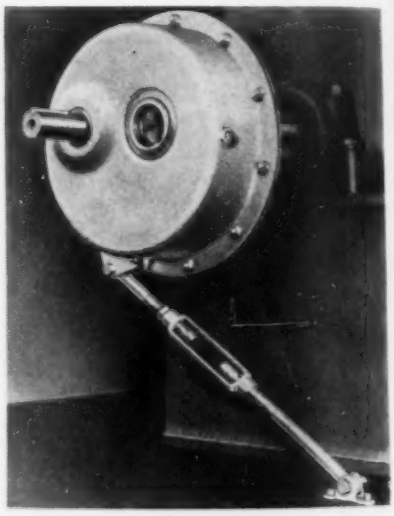
Diamond check

A set of Master Comparison Slides for use in microscopic inspection of diamond abrasives is being offered to help diamond users make a quick, accurate check of diamond particles for grading and degree of purity. The slides, when used with a microscope, will permit examination of diamond particles in grades ranging from 1 micron to 100 mesh through comparison of the diamond powder or compound with the diamond on the master slide. Determination of impurities may also be made microscopically with the aid of a polarizing attachment. *Elgin National Watch Co., Abrasives Div.*

For more data circle No. 34 on postcard, p. 109.

Shaft mounted drive

New speed reducer mounts directly on the shaft to be driven and requires no floor space other than that needed for the motor and tie rod connection. Easily adapted to fit various driven shaft diameters, this drive offers comparatively high ratios of speed reduction in very limited space. Choice of single



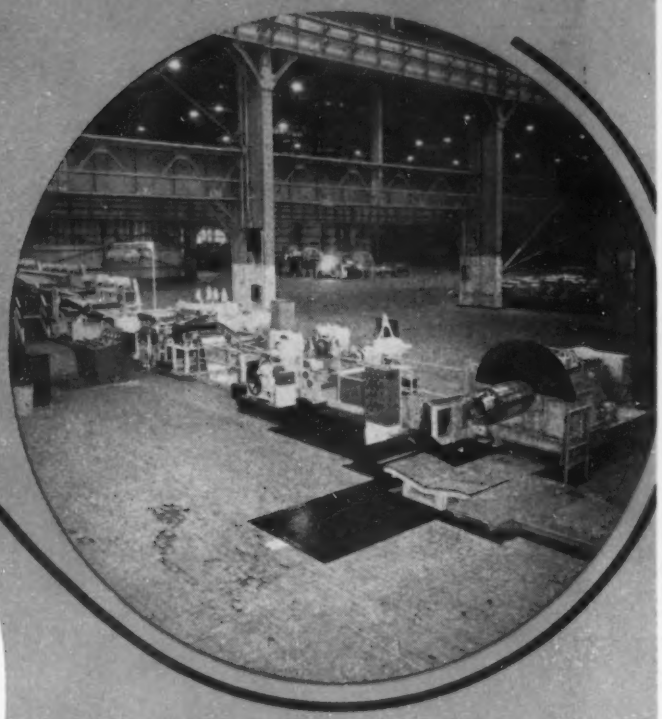
or double reduction unit makes possible the selection of almost any output speed between 420 and 14 rpm, by changing sheave sizes within allowable limits. Six sizes to cover the range from ½ to 30 hp. All-steel construction, efficient helical gearing, and positive lubrication. *Falk Corp.*

For more data circle No. 35 on postcard, p. 109.

Turn Page

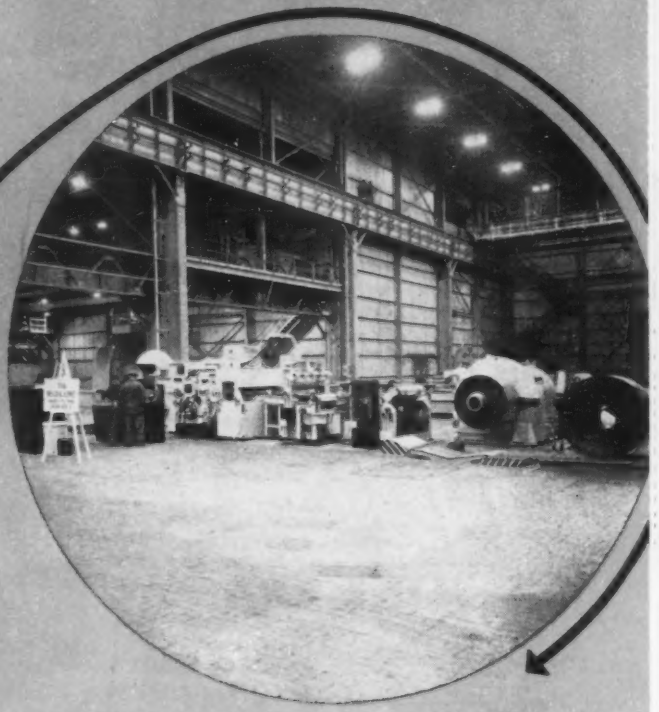
TIN SHEARING LINE . . . Receives coils (up to 36,000 pounds) from Temper Mill. Material is side trimmed, sheared to specified lengths and classified into primes and seconds . . . all automatically. This Aetna-built line in the Fairless Works of U. S. Steel has a rated speed of 1250 f.p.m. for regular tin plate gauges in sheet sizes up to 38" x 43".

Tin Shearing Line built by Aetna-Standard for Fairless Works, U. S. Steel.



Flat-Rolled Equipment

SHEARING AND CLASSIFYING · SCRUBBING AND DRYING · RECOILING · SLITTING AND SIDE TRIMMING · ROLLER LEVELERS · PAY-OFF AND TENSION REELS · SIDE TRIM AND RECOIL · SIDE TRIM AND SHEAR · TIN PLATE, SIDE TRIM AND SHEAR · CLASSIFYING



SIDE TRIMMING AND RECOILING LINE . . . This 40" line prepares coils for the Electrolytic Tinning Line of Fairless Works, U. S. Steel. The strip (in coil form) is side trimmed at speeds up to 4000 f.p.m. The line operates under tension with ends of coils joined by seam welding. Close tolerance and high speeds are essential to the successful operation of the line.

40" Side Trimming and Recoiling Line in Fairless Works of U. S. Steel.

THE AETNA-STANDARD ENGINEERING COMPANY · PITTSBURGH, PA.

Aetna-Standard

PLANTS IN WARREN, OHIO · ELLWOOD CITY, PENNSYLVANIA

GOOD EQUIPMENT BRINGS DOWN PRODUCTION COSTS

SUBSIDIARY and ASSOCIATED COMPANIES

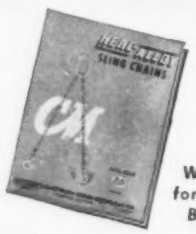
Head Wrightson Machine Company, Ltd., Middlesbrough, England — Great Britain, Finland, Sweden, Norway, Denmark, Union of South Africa, Northern and Southern Rhodesia.
Aetna-Standard Engineering Company, Ltd., Toronto, Ontario, Canada.
M. Castellvi, Inc., New York, N. Y. — Mexico, Central and South America.
Societe de Constructions de Montbard, Paris, France — France, Belgium, Holland, Luxembourg, Switzerland.
Demag Aktiengesellschaft, Duisburg, Germany — Germany, Austria, Yugoslavia, Greece, Turkey, Egypt.
Compagnia Italiana Forme Acciaio, Milano, Italy — Italy.
Aetna-Japan Company, Ltd., Tokyo, Japan — Japan.
Hale & Kullgren, Inc., Akron, Ohio — Representative for the Rubber Industry.
Standard Engineering Company, Ellwood City, Pa.
Trans-World Traders, Pittsburgh, Pa.

Designers and Builders to the Ferrous, Non-Ferrous, Leather, Rubber, and Plastic Industries

SPECIFY

HERC-ALLOY

SLING CHAINS



Write for Data Book

HERC-ALLOY Sling Chains are made-up to order, are individually tested, registered and guaranteed.

Hundreds of plants like the one shown above* are using Herc-Alloy Sling Chains. Greater safety is their big reason for doing it. But there are other factors too. Herc-Alloy is economical because of its long service life. Then too, the use of alloy steel permits a weight reduction that helps prevent worker fatigue. These advantages are worth thinking about. Those who do consider them seriously generally adopt safe Herc-Alloy Sling Chains for their plants.

*LAKE ERIE ENGINEERING CORPORATION — MANUFACTURER OF HYDRAULIC PRESSES

CM HOISTS AND CHAIN

COLUMBUS McKINNON

CHAIN CORPORATION

TONAWANDA, NEW YORK

DISTRICT OFFICES: NEW YORK, CHICAGO, CLEVELAND

Drill jig bushings

The Serragrip, one of three new types of drill bushings, is made especially for use in soft metal tooling, Fibreglas, wood, plastic and masonite. It can be pressed into softer materials without shearing and design will not permit slipping

or rotating. Deltagrip and Hexagrip drill bushings are made for use in castable materials such as cerromatrix, plastic, etc. They can't slip or rotate in the material cast around them. They are made to withstand the torque and thrust of the tool; they won't spin out. *American Drill Bushing Co.*

For more data circle No. 36 on postcard, p. 109.

Hard faced seat rings

A line of seat rings, precision made from carbon, stainless or tungsten die steels and hard faced at points of wear and impact with Stellite overlays provide a wear surface that increases load carrying capacity and operating life. They

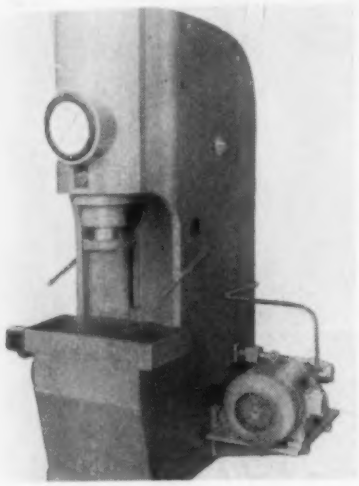
are available in 1 to 14 in. diam sizes and are furnished to meet specified tolerances. Applications include all forms of poppet type valve seating requirements as found in high pressure industrial and blow-off valves, internal combustion engines and steam valves. *Cleveland Hard Facing, Inc.*

For more data circle No. 37 on postcard, p. 109.

Turn to Page 125

Straightening press

Vertical hydraulic straightening press has rapid advance, power pressing, and rapid return stroke. Manufactured in 75, 100 and 150-ton capacities, the machine can be supplied, as illustrated, with a large dial-type pressure gage and remote control adjustment for relief valve



setting. The hydraulic circuit includes two separate pumping units both of which are used for the rapid advance and return stroke. Only one of the units is used for the power pressing stroke. A decompression valve in the hydraulic circuit automatically prevents high pressure shock when the machine ram stroke is reversed. *American Broach & Machine Co.*

For more data circle No. 38 on postcard, p. 109.

Handy planning tool

A small working model of the Towmotor Model 480-P fork lift truck has been developed to help industry plan and work out materials handling and warehousing problems on a scale basis. The model, an exact replica of the Towmotor One-Man-Gang, has many features of its prototype: forks may be raised or lowered; mast tilts; model rolls on rubber tires. It is made from steel and plastic; measures 8 in. long x 5¼ in. high x 2¾ in. wide. *Towmotor Corp.*

For more data circle No. 39 on postcard, p. 109.

Nut retainers

Speed Grip nut retainers have been shaved in size to accommodate application in restricted areas where panel hole sizes are limited. The new fasteners embody all the advantages inherent in the regular line. Designed for application to various panel thicknesses ranging from 0.025 to 0.063, the smaller spring-tension fasteners are easily applied by hand, provide floating alignment, and possess very high torque and holding power. Offered with a stainless steel nut and retainer. *Tinnerman Products, Inc.*

For more data circle No. 40 on postcard, p. 109.

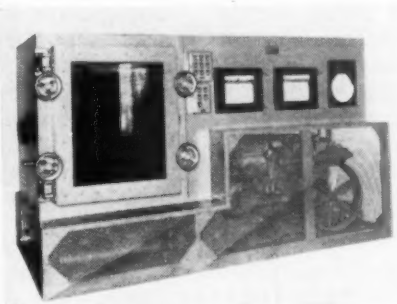
Twist drills in sets

Sets of high-speed steel twist drills are now packaged in plastic bags. Individual pockets for each drill are marked with the size of the drill in that pocket. The bag is furnished free with the set. Four sets are available in jobber length drills and machinist length drills. *Hayden Twist Drill Co.*

For more data circle No. 41 on postcard, p. 109.

Simulated environment

An environmental simulation chamber will provide up to 7½ psi positive pressure in addition to automatically controlled temperature-altitude-humidity simulation. Temperatures from +185°F to −100°F



can be maintained at altitudes up to 60,000 ft. Other features include automatically controlled relative humidity from 20 to 100 pct, automatic control of pressure and altitudes, and automatic draining of all humidity devices below freezing. *American Research Corp.*

For more data circle No. 42 on postcard, p. 109.

Low cost air

How much does your compressed air cost?

Probably more than you think. The biggest cost in compressed air isn't the price of the compressor; it's the operating cost: the power needed to produce each cubic foot of air, the amount of service and repairs needed. That's why it will pay you to replace your old or inefficient compressor with a DeVilbiss Air Compressor. You'll save on power, upkeep and depreciation. *DeVilbiss Air Compressors deliver more air for the money.*

For a complete analysis of your compressed air needs, contact your local DeVilbiss jobber.

DeVilbiss has an Air Compressor to fit your needs, from ½ to 15 hp., single or two stage, Upright or V Type.

THE DEVILBISS COMPANY
Toledo, Ohio

Barrie, Ontario • London, England
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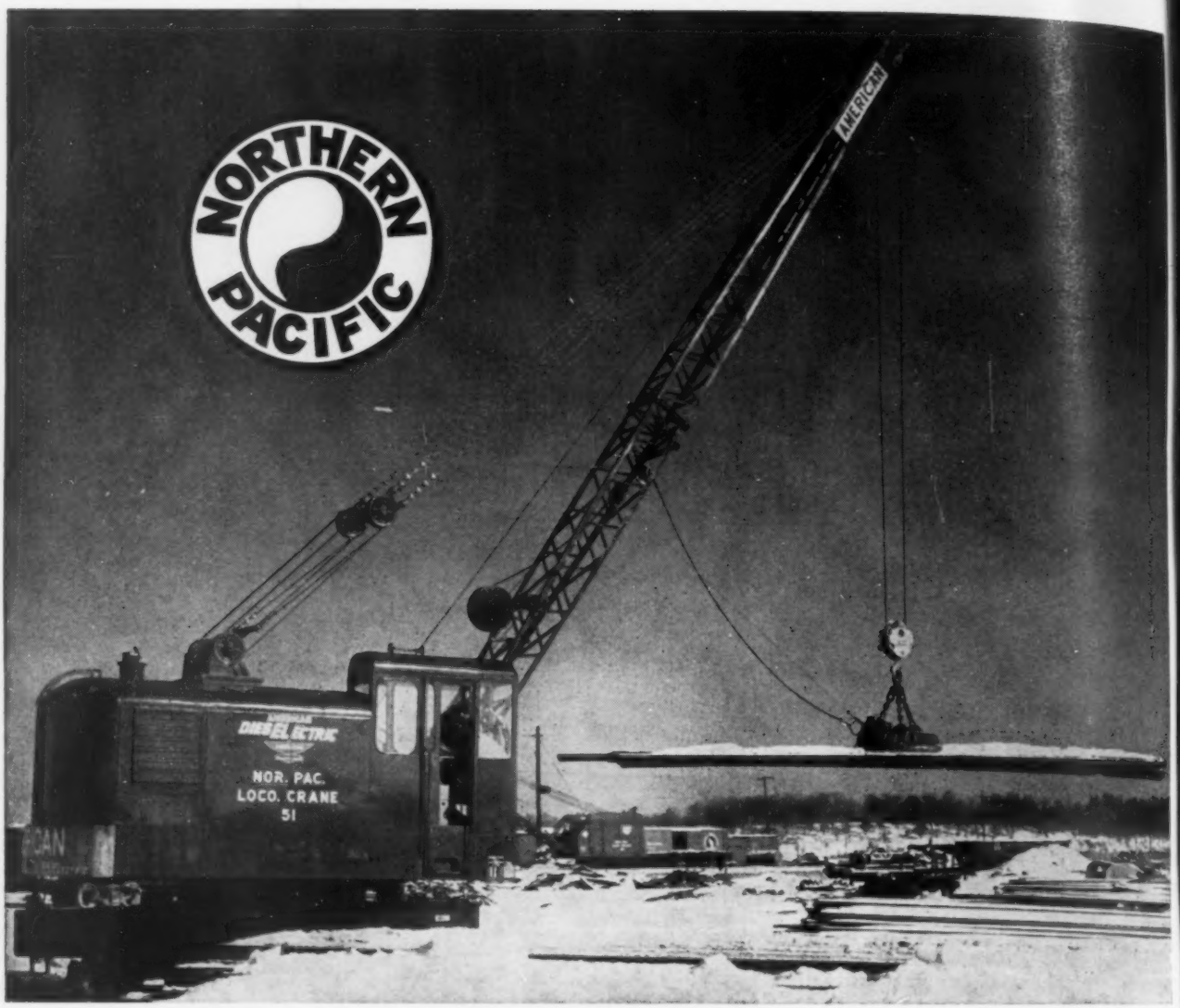
BRANCH OFFICES IN PRINCIPAL CITIES

FOR BETTER SERVICE, BUY
DEVILBISS



Fast materials handling with Dependable American DiesELectric

Hundreds of materials handling jobs are solved by these easy-to-operate American DiesELectric Locomotive Cranes for industry across the country. Quick and economical, they cut maintenance costs to a minimum and keep production at a maximum.

In nearly every industry . . . steel, mining, pulp and paper, construction and industrial plants of all kinds... American DiesELectric Locomotive Cranes are streamlining operations in a way that adds to profits!

Fast, smooth-operating American DiesELectric Locomotive Cranes with diesel power to the deck, electric power to the trucks require a miminum of maintenance. In fact, detailed cost and operating records prove an American DiesELectric Locomotive Crane *will write off its cost fully in five short years!*

Cut the cost of materials handling—*See American First!* Our specialists are at your service. Write or call today!

Modernize...economize...with

American Hoist

AMERICAN HOIST & DERRICK CO. • ST. PAUL 1, MINN.

For the BIG PRODUCTION jobs of industry...

AMERICAN LOCOMOTIVE CRANES

The Iron Age

SALUTES

J. Ralph Patterson

Faith in his firm, industry and country make pessimism a dirty word to this top steel salesman.

WHEN the Lord passed good dispositions around, Ralph Patterson must have taken a second helping. Vice-President in charge of sales for Mackintosh-Hemphill Co., Pittsburgh, Ralph is the sort of person who has no time for pessimists or pessimism.

Mack-Hemp customers are always glad to have Ralph drop around. He never fails to come up with some good solid reasons why the U. S., the world, and the steel industry are not going to hell in a wheelbarrow, after all.

"Pat" Patterson has been selling steel in one form or another for nearly 40 years. In his 32 years with Mack-Hemp he has sold rolls and industrial machinery in the U. S., Europe, and South America.

He got into the steel business in 1913 with the former Pittsburgh Crucible Steel Co., at Midland, Pa. Later he was a field engineer with Jones & Laughlin when that company was building its Aliquippa pipe mill.

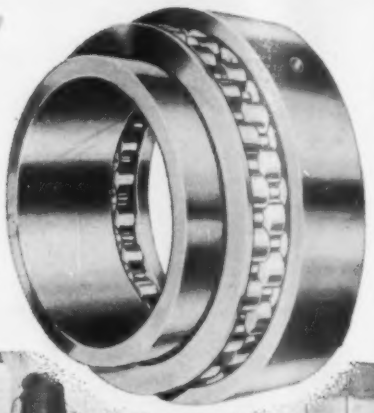
After several years as a draftsman with Pittsburgh Iron & Steel Foundries Co., Ralph switched to the sales end of the business. When this company was absorbed by Mack-Hemp in 1922, he became assistant manager for Adamite sales. In 1933 he became general manager of sales, and 6 years later a vice-president. He has been a member of the Mack-Hemp board since 1944.

Ralph's sales career must have impressed his sons because both are now steel salesmen—a matter of some pride to their father.

Ralph has had no time for hobbies, as such. Closest he's come to a hobby is his love of the flowers and shrubs he putters around with in his yard in Beaver, Pa., near Pittsburgh. He dabbles in photography, likes to take pictures of his six grandchildren.

Exceptional load capacity and heavy-duty operation of

ORANGE "STAGGERED" ROLLER BEARINGS

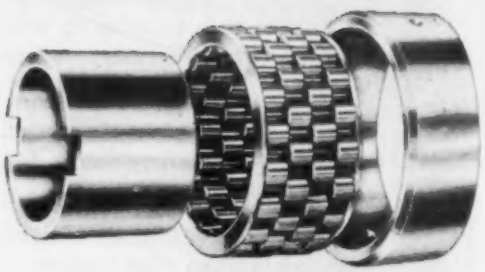


--proved by 10 years' Rugged Service in the Plate Mill at KAISER STEEL CORPORATION, FONTANA WORKS

Orange Staggered Roller Bearings are installed in the approach table in the two-high roughing stand at the Fontana Works, who report satisfactory experience with Orange bearings since the plant was originally constructed in 1943.

The unique staggered design of Orange Staggered Roller Bearings distributes the load over many short rollers, instead of a few full length rollers. This eliminates skewing tendencies of long rollers—provides closer centers for maximum supporting area—assures smooth, precision running due to uniform distribution of load—and results in longer bearing life and extra margin of safety for your installations.

Orange Staggered Roller Bearings are available in a full range of standard sizes, fully interchangeable with other bearings in complete unit or component parts. Engineering service and stocks in all industrial centers. Submit your problems to our engineering department.



Shown are end views of an Orange "Staggered" Roller Bearing (upper) and a conventional roller bearing. Note how staggered roller design provides a multiplicity of contact points within the loaded zone.

Write for Engineering Data Book showing sizes, capacities, installation data, etc.

ORANGE ROLLER BEARING CO., INC., 570 Main Street, Orange, N. J.

The Iron Age

INTRODUCES

William Adam, Jr., elected president, AJAX ELECTRIC CO.

W. Tyrone Gillespie, has been promoted to assistant to the president, THE DOW CHEMICAL CO., Midland, Mich.

J. R. Spence, appointed vice-president, Alloy Rod & Metal Div., VICTOR EQUIPMENT CO.

Fred H. Johnson, named assistant to the vice-president in charge of steel manufacturing, INLAND STEEL CO., Indiana Harbor Works, Indiana.

Kenneth S. Bates, appointed assistant treasurer, Chicago office, UNIVERSAL ATLAS CEMENT CO., succeeding E. M. Johnson who has retired. **Thomas J. Thorpe,** promoted to credit manager, Kansas City Office.

Edwin A. Walcher, Jr., elected a member of the board of directors, GENERAL STEEL CASTINGS CORP.

William L. Hahn, named chairman of the board, Maytag West Coast Co., distributor of appliances for THE MAYTAG CO.

Elmer C. Schacht, reelected president, Behr-Manning Corp., subsidiary of NORTON CO., Worcester.

A. B. Drastrup, elected to board of directors as executive vice-president, A. M. BYERS CO.

W. E. Spaninger, becomes director of purchases and production manager LEE WILSON ENGINEERING CO., INC., Cleveland.

James R. Ireland, appointed assistant director of research, THE INDIANA STEEL PRODUCTS CO., Valparaiso, Ind.; and **James G. Richmond,** named assistant manager of the manufacturing division.

Robert O'Hara, becomes sales engineer, Fielden Instrument Div., Detroit office, ROBERTSHAW-FULTON CONTROLS CO.

Gary Stevens, appointed senior metallurgist, Armour Research Foundation of ILLINOIS INSTITUTE OF TECHNOLOGY, Chicago.

Edward J. Charlton, becomes manager of fabrication, Lukenweld Div., LUKENS STEEL CO.; **Frank C. Kardevan,** joins the field sales organization as field sales engineer, and **William H. Funk,** becomes acting manager, New Products Development. All appointments are effective Feb. 22.

Hal Schleitwiler, appointed manager of industrial relations, NATIONAL CAN CORP.

Martin J. Hartigan, appointed manager of supply purchases, JOSEPH T. RYERSON & SON, INC.

Robert J. Johnson, joins the Pittsburgh Technical Section, Development and Research Division, THE INTERNATIONAL NICKEL CO., INC., New York.

George H. McBride, appointed manager, Micarta, Div., WESTINGHOUSE ELECTRIC CORP., Pittsburgh.

Joseph A. Mark, promoted to commodity advertising manager for paint products, NATIONAL GYPSUM CO.

DR. WARREN C. LOTHROP, appointed a vice-president, Arthur D. Little, Inc., Cambridge, Mass.

F. H. MOTT, elected administrative vice-president in charge of all plant operations in Michigan, Eaton Mfg. Co.

CLIFFORD G. STROTE, appointed director of purchases, American Chain & Cable Co., Inc., Bridgeport.

Personnel

Ralph W. Preston, has been appointed sales engineer, Houston, THE TIMKEN ROLLER BEARING CO., Canton.

Austin F. Leach, appointed manager of product service, Welding Dept., GENERAL ELECTRIC CO., York, Pa.

A. A. Throckmorton, appointed sales manager, GENERAL SMELTING CO., Philadelphia.

Donald A. Pengelly, appointed assistant branch manager, factory branch, TRAILMOBILE, INC., Syracuse.

Robert C. Carrick, appoined service engineer, EDGEWATER STEEL CO., Oakmont, Pa. headquarters.

L. Wilson Thomas, Jr., was appointed sales training supervisor, Columbia-Geneva Steel Div., U. S. STEEL CORP., San Francisco, Calif.

A. S. Kromer, appointed general manager, Calumet Div., CALUMET & HECLA, INC., Chicago.

Carl M. Foreman, Jr., appointed district sales manager, Dayton, Ohio District, PITTSBURGH STEEL CO., Pittsburgh.

Jules K. Egerman, appointed district manager of sales, Columbia-Summerill, COLUMBIA STEEL & SHAFTING CO., Pittsburgh.

Thomas B. Herndon, appointed sales manager, production equipment, THE NATIONAL SUPPLY CO., Pittsburgh, Pa.

Roy E. Heffner, named a district sales manager, DEWALT INC., Lancaster, Pa., subsidiary of American Machine & Foundry Co.

Milton A. Steege, named credit manager, Baltimore Credit District, Metal Div., CONTINENTAL CAN CO.

EDWIN C. EVANS, elected vice-president, Behr-Manning Corp., subsidiary of Norton Co.

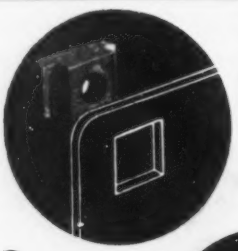
LEON E. HOOGSTOEL, elected vice-president, Behr-Manning Corp., subsidiary of Norton Co.

S. M. PEARL, becomes director of sales, Nikoh Electrical Metallic Tubing & Teletube products, Nikoh Tube Co., Chicago.

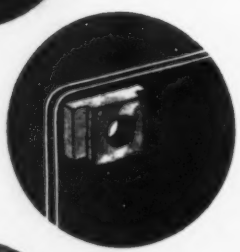
C. P. MAYER, appointed manager of roll sales, Mesta Machine Co., Pittsburgh.

Fast-On CLINCH NUTS

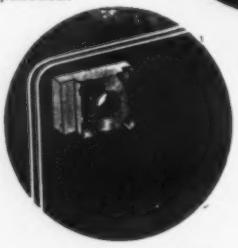
"Fast On" clinch nuts increase thread area and use of lighter gage metal. They cut assembly, using shorter screws and speeding up assembly. Our engineers can help you improve your product.



1 The square shape simplifies installation.



2 The small square portion is inserted and protrudes through the square hole that has been previously punched.



3 The protruding portion is now clinched at 4 corners with swaging tool.

4 Nut cannot work loose and variation in thickness of metal is taken care of automatically.

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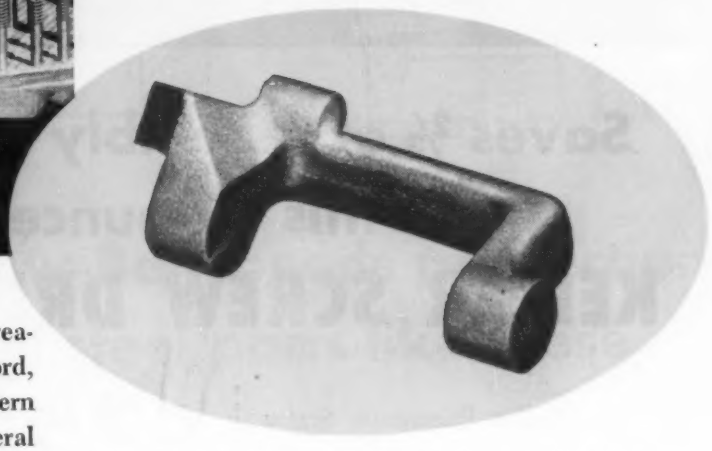
Phone KEnwood 2-1380

Here's how General Electric Shell Molding Resins and a new bonding machine CUT FINISHING COSTS UP TO 50%

CUT PRODUCTION TIME 56%



Reduced finishing costs up to 50% are being realized by Merrow Machine Company, Hartford, Conn., on yokes shell-molded by Production Pattern & Foundry Company, Chicopee, Mass. General Electric resins are used both to make the shell halves themselves and to seal them together on a new bonding machine, developed by Shell Process, Inc., which makes pouring without backup possible.

Merrow reports that the fine finish of the shell-molded castings reduces finishing costs up to 50%! Appearance is vastly superior to that obtained by conventional sand-casting methods.

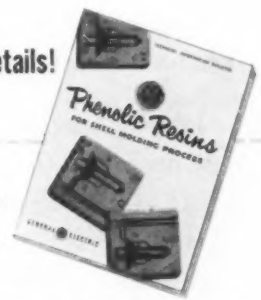
Production Pattern reports that fast-curing G-E shell resins on the molding machine and a special resin on the new bonding machine cut casting production time by 56%! A single operator can produce the shell halves and join them in a continuous cycle. G-E resins impart good hot rigidity to shells, resulting in low warpage, intimate sealing and close tolerances with low finning; high strength for good reproductivity and minimum metal reaction.

You can put your confidence in

GENERAL ELECTRIC

General Electric, makers of molding and bonding resins, as well as a silicone parting agent for the shell process, would like to tell you more about the cost-cutting possibilities of this new foundry technique. *Just mail the coupon for free samples and technical data!*

Send coupon today for more details!



General Electric Company
Section 418-1B, Chemical Division
Pittsfield, Massachusetts

Please send me:

Data	Sample	
( )	( )	G-E phenolic shell resin (medium cure)
( )	( )	G-E phenolic shell resin (fast cure)
( )	( )	SM-55 silicone parting agent

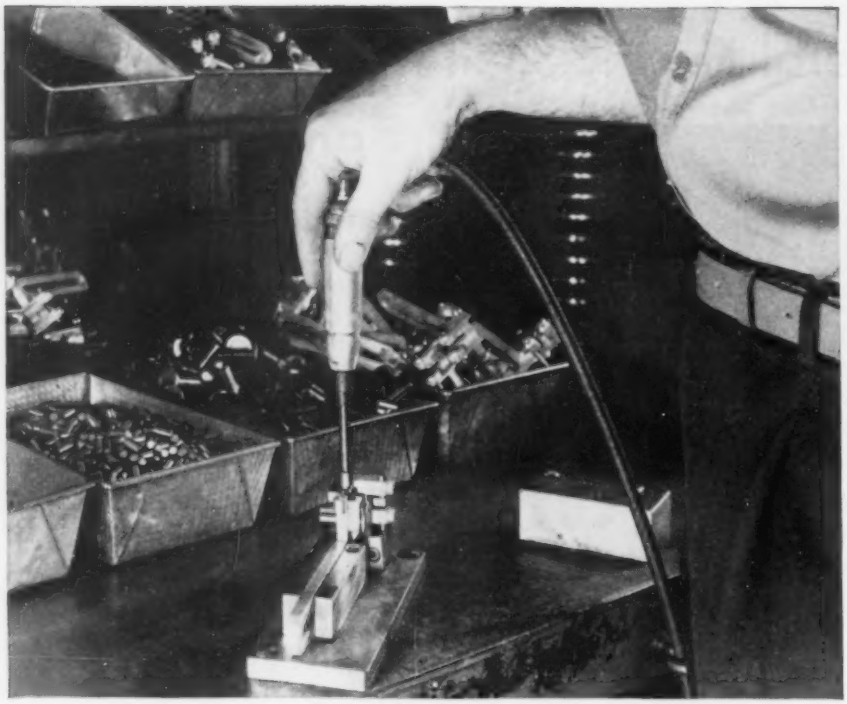
I want this for: ( ) Reference purposes only ( ) An immediate application on_____

Name_____

Firm_____

Street_____

City_____ Zone___ State_____



Saves ⅔ of Assembly Time with this 10-ounce KELLER SCREW DRIVER

The Keller Pneumatic Screw Driver shown above—Model 12D-2C—is used in assembling parts for a power band saw. It has increased production per man-hour to three times as much as it was before. Similar results are reported from other shops where it has been installed.

It is lightweight (10 oz) and well proportioned to fit the operator's hand. It has pneumatic pick-up and a pressure control. It is so easy to handle and use that it makes assembly a breeze.

Facts in Brief about KELLER Screw Drivers

- Weigh less—reduce fatigue
- Consume less air
- Interchangeable parts—wide variety of handles, gearings, torques, speeds
- Clutches, 45° and 90° attachments for every requirement

Send for descriptive literature and detailed information

KELLER TOOL COMPANY

GRAND HAVEN, MICHIGAN

—Personnel—

Robert F. Frazure, promoted to assistant district manager, Chicago district, FIRTH STERLING INC., Pittsburgh.

John G. Fleming, appointed product planning manager, THE BRISTOL CO., Waterbury, Conn.

Franklin H. Bivins, named general manager, VITRO RARE MATERIALS CO., division of Vitro Corp. of America.

Jack H. Cobb, has joined the Chicago sales office, ELECTRIC CONTROLLER & MFG. CO., Cleveland.

G. A. Fuchs, appointed general superintendent, Fire Brick Division, LACLEDE-CHRISTY CO., St. Louis, Mo.

Elmer F. King, appointed, metal finishing sales representative, New England area, FREDERIC B. STEVENS, INC.

R. Paul Bunting, appointed Norfolk, Va. district representative, MIDWEST STEEL CORP., Charleston, W. Va.

Richard A. Burkett, named representative, Chicago area, PENN PRECISION PRODUCTS INC.

OBITUARIES

Thomas R. Heyward, Jr., for many years president and for the past two years chairman of the board, The Duraloy Co., Stottdale, Pa. recently after a short illness.

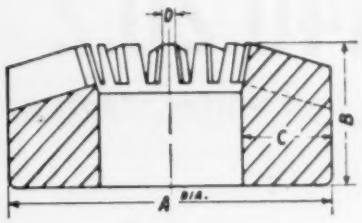
Charles J. Hones, president, Charles A. Hones, Inc., New York.

Hobart A. Green, 56, president, Royal Metal Manufacturing Co., Chicago, recently.

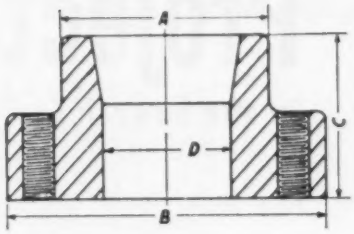
Neil E. Salsich, 70, vice-president and director, The Jeffrey Manufacturing Co., suddenly in Bethlehem, Pa.

James A. Eden, 84, mechanical engineer, conducted his own business until his retirement 2 years ago.

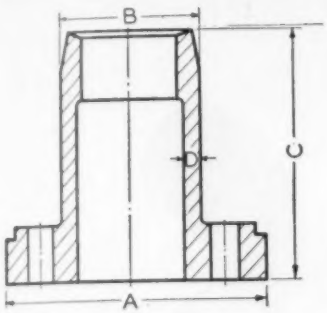
PERFORATING DIE



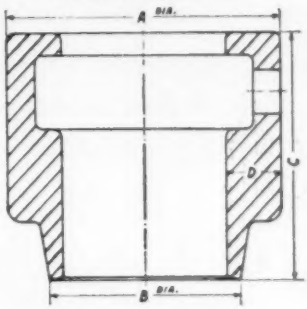
SIZING DIE



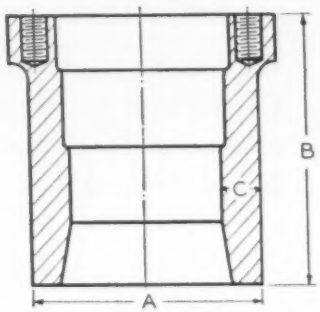
FORMING AND PIERCING DIE



UPSETTER DIE



BLANKING AND FORMING DIE



How Graph-Mo® Hollow-Bar speeds production of ring-shaped tool steel parts like these

New GRAPH-MO® HOLLOW-BAR eliminates drilling—and machines 30% faster

IF you make ring-shaped tool steel parts, you can start with finish boring by using Graph-Mo® Hollow-Bar. There's no drilling—the hole's already there. You speed production, cut scrap waste and save steel.

At the same time, you get all the proved advantages of Graph-Mo. Because of the free graphite in its structure, Graph-Mo machines 30% faster than other tool steels; has a minimum tendency to pick up, scuff or gall. And the combination of free graphite and diamond-hard carbides gives Graph-Mo Hollow-Bar exceptional durability. Users report that it outwears other tool steels on an average of 3 to 1.

Stability tests prove Graph-Mo is the most stable tool steel ever made. For example, after 12 years a typical Graph-Mo steel master plug gage showed less than 10 millionths of an inch dimensional change. It responds uniformly to heat treatment, too.

Make sure you're getting all the advantages of Graph-Mo Hollow-Bar if you make ring-shaped tool steel parts. Sizes range up to 16″ O.D. with a variety of wall thicknesses. Graph-Mo Hollow-Bar is distributed through A. Milne and Co. and Peninsular Steel Co. warehouses.

For more information about Graph-Mo Hollow-Bar, write The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

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Project 140.20.2

in the search for new and better steels and steelmaking methods

Not many weeks ago, Inland released a book reporting new findings in the continuing search for ways to improve the corrosion resistance of Tin Plate. The highly technical report was important to relatively few men, restricted to a handful of companies in a single industry. Yet it represented several years' research by top men in the country.

We mention this merely to remind you that Inland's Research and Development Department is constantly probing for improved products and processes. And, over the years, a great many Inland steel users have benefited.

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The Iron Age
FOUNDED 1855
Technical Articles

◆ Knowledge of the physical, chemical and metallurgical properties of the wrought heat-resistant alloys can aid considerably in proper selection and pay off well in savings of time and money . . . They are easily obtainable in commonly used mill forms . . . By proper selection, they can meet service requirements and make it unnecessary to rely on more expensive, harder-to-get materials.

◆ Included in this standard group of alloys are Types 330, 310, 309, 430 and 446 . . . Careful evaluation of their properties should extend their use . . . RA-330 alloy has proved outstanding for many heat-resisting applications . . . Minor alloying elements play an important part in their composition.

Low-Cost Alloys Offer Good Heat Resistance

By R. W. Boring
Vice-President, Sales
Rolled Alloys, Inc.,
Detroit

◆ CAREFUL SELECTION of materials for elevated temperature use pays off in increased service life, lower cost and ease in obtaining essential materials promptly. With a comprehensive knowledge of high-temperature alloys, including room and elevated-temperature properties, it is often possible to select an alloy material which fits the job and is readily obtainable rather than rely on an expensive, tailor-made, hard-to-get material.

A knowledge of the properties of heat-resistant alloys enables the user to specify confidently the alloy that will best meet his specific service requirements. Even if special requirements are not met, the metallurgist can promptly eliminate standard wrought alloys from consideration.

Uses and requirements for heat-resisting metals have grown tremendously in the past few years. To meet these increased demands, the metal industry has endeavored to develop and produce alloys with improved properties.

Considerable attention has been given to new, highly alloyed materials. Many new analyses have come into prominence, especially in the high strength or superalloy class. Most of these

Rigid control of chemistry and structure strongly influence the alloy's properties and uses . . .

alloys, however, are either too expensive or do not lend themselves readily to fabrication. Hence, they have not been adopted for a wide range of applications involving heat resistance.

Improvements in heat-resisting alloys have been achieved predominantly through increased knowledge and control of production and use of established, lower cost alloys. Included in this latter group is the RA-330 analysis which has been proved outstanding for many heat-resisting applications.

Rigid control of chemistry and structure strongly influence the properties and, consequently, the potential uses of such an alloy. The particular combination of 35 pct Ni and 15 pct Cr with iron imparts the alloy's, desirable, heat-resisting characteristics. The primary function of chromium is to provide oxidation resistance. Strength and sulfidation resistance are added benefits. Nickel provides strength, ductility, toughness and grain refinement. Nickel also contributes resistance to carburization, creep, thermal shock and oxidation.

Chrome content has been established at 15 to 16 pct since this amount, in conjunction with 35 pct Ni, affords ample resistance to scaling in oxidizing atmospheres at temperatures as high as 1950°F. The effect of additional chromium is very slight; amounts approaching 24 pct have to be added before the benefit is noticeable.

Many investigators have charted the effect of chromium on scale resistance of steel. Scale resistance at the higher operating temperatures increases very rapidly with increasing chromium up to a limit and then levels off abruptly. These limits are approximately 15 pct Cr at 1600°F, 16½ pct at 1800°F, 17½ pct at 2000°F and 26 pct at 2200°F.

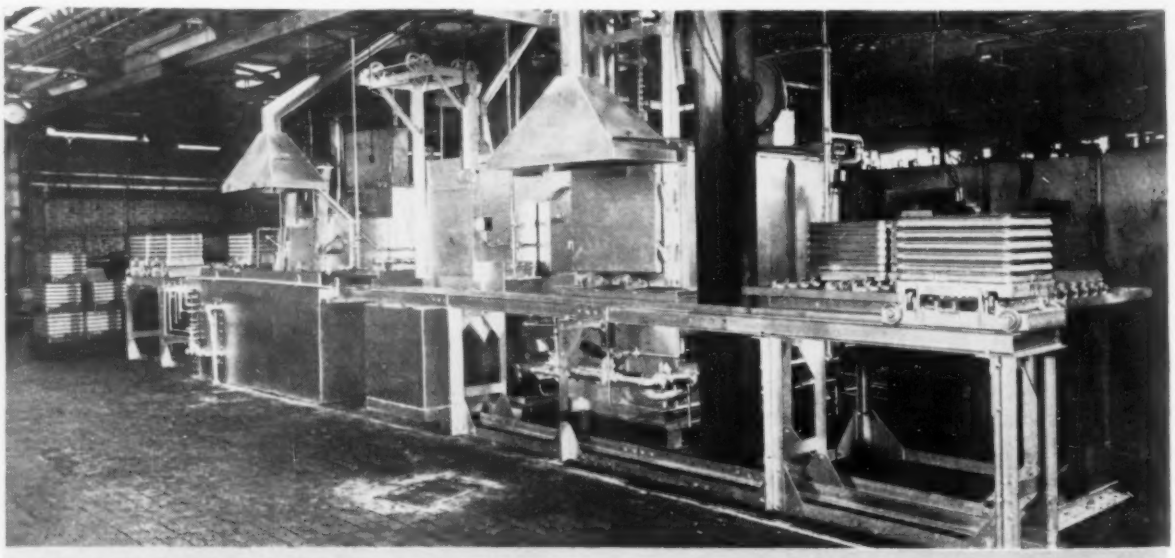
The effect of nickel is to lower the critical chromium content. With 35 pct Ni, the sudden change in scaling at the first three temperatures occurs below 15 pct Cr. This is due in part to the nickel itself which is oxidation resistant and also to the lesser amount of highly oxidizable iron.

Maximum high-temperature strength through solid solution of chromium is also obtained, apparently at a value less than 15 pct. Experiments show that increased chromium fails to produce a stronger alloy at elevated temperatures.

How creep properties are affected

Room-temperature properties, are affected, especially yield strength and ductility, so that fabrication may become more of a problem with any sizeable increases in chromium. Actually, about 12 pct Cr would satisfy most strength requirements. At one time, an alloy of 35 pct Ni and 12 pct Cr was produced for its high-strength properties. However, this has given way to the 15-pct Cr alloy for better oxidation resistance, even though strength properties are about the same.

High-temperature strength is also a function of nickel content and, with 15 pct Cr reaches a maximum over 30 pct Ni. Creep resistance follows the same pattern. Nickel and iron together, in rather substantial quantities, are necessary for good creep propertites. Types 310 stainless, and the higher nickel alloys such as 60 pct Ni, 15 pct Cr, tend to bear this out. In the former, iron content is comparable to that of RA-330 but the nickel is lower. In the latter, nickel is higher but the iron is lower. Both alloys are in-



CONTAINERS made of RA-330 alloy are used in a controlled-atmosphere furnace for carburizing, carbonitriding and clean hardening with quench oil. Corrugated design adds strength.

COLOR CODE identifies analyses of a variety of round, square, flat and hex bars. Heat-resistant alloys are easily obtainable in commonly used mill forms, thus saving time and money.

ferior to type 330 with respect to creep properties.

Accordingly, nickel content could vary between about 31 pct and 40 pct and strength and creep would remain practically constant. This stability is the primary reason for the broad nickel range of 33 to 36 pct for AISI Type 330. Nickel limits are 34 to 37 pct in RA-330 to provide for better control of thermal expansion and modulus of elasticity.

Nickel has a similar effect on thermal expansion in the Cr-Ni-Fe alloys as in the straight nickel irons. With 35 to 36 pct Ni, RA-330 has an extremely low coefficient of expansion for the Cr-Ni alloys. This particular property increases scale resistance, especially in cyclic operations where scale tends to pop off. It also greatly enhances resistance to thermal shock.

Ductility related to carbon

Resistance to carburization is also a function of the nickel content up to a certain point. Alloys in the 30 to 40 pct range have proven much superior to alloys in the 20 to 30 pct range in resisting carbon pickup. These alloys are on a par with the much higher nickel alloys in the temperature range of 1600° to 1750°F.

Minor alloying elements are also important in the overall composition. They can either improve or detract from the basic characteristics already mentioned.

Carbon increases both the high- and low-temperature strength but at the expense of ductility, if in very large amounts. It is, therefore, maintained at about 0.10 to 0.15 pct in RA-330. This amount is readily soluble and contributes some strength, yet it is relatively free from embrittlement under normally recommended operating conditions. Bar stock, however, is produced with carbon in the 0.45 to 0.50-pct range for applications where maximum strength is required, even at the expense of ductility and oxidation resistance.

Manganese has little effect upon the final physical properties. Its chief benefit is in improving hot workability and is therefore, most advantageous to the producer. Usually 0.75 to 1.00 pct Mn is adequate. Under present mill processing conditions, it is not necessary to adhere to the high side of the 2.00 pct Mn maximum allowed.

Silicon is equal, if not superior, to carbon in importance as a minor alloying element. It has the advantage of increasing resistance to scaling and carburization but its disadvantages are loss of ductility and lack of weldability. Considerable investigational work has been done regarding carburization versus silicon content. Comparisons of 0.40, 0.75 and 1.25 pct Si material, under identical carburizing conditions, show a wide variation in the amount of carbon absorbed.

As silicon increases, carbon pickup drops from 1.70 pct to 0.65 pct, with the greatest drop occurring between 0.40 and 0.75 pct Si. Other data have indicated that maximum benefits are obtained when silicon is present in amounts between 2 and 2½ pct. However, difficulties in hot working and welding in fabrication preclude general use in this range. The silicon limits, therefore, are established by the hot working and fabrication operations.

Welding engineers, through extensive studies, have been able to improve welding rods and welding techniques to such an extent that 1.50-pct Si material can be successfully welded. The silicon limits of RA-330 have been set at 0.75 to 1.50 pct with an aim of 1.25 pct to take optimum

Minor alloying elements, important in the overall composition, shape basic metal properties . . .

Aim in making RA 330 has been to control grain size at an intermediate range offering best conditions for all operations . . .

advantage of silicon content and still provide a material that can be easily fabricated.

Elements such as molybdenum, tungsten, titanium and columbium may be added for strength or carbon tie-up. Usually, accompanying each advantage of these alloys are disadvantages in hot workability, fabrication or oxidation resistance.

Structurally, alloy 330 is austenitic under all conditions. Even though carbides are present, it is regarded as a single-phase alloy. Practically the only changes that occur are in grain size and the amount of carbon and its distribution. These seem rather simple, but their effects upon properties can be quite serious and should be considered constantly.

Grain size a problem

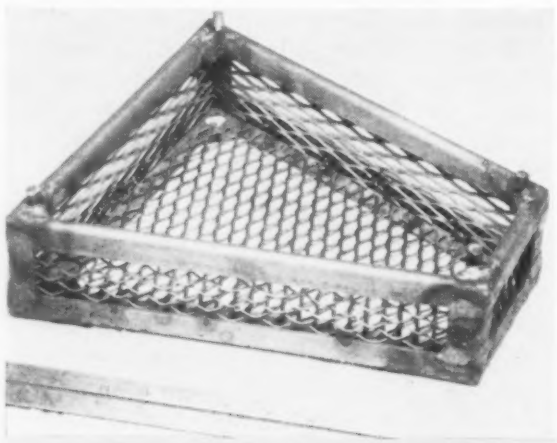
Grain size is generally established by mill annealing practice although exceptions may result from cold work prior to service or overheating in service. Grain size generally remains stable through temperatures of 2000° to 2050°F, but increases thereafter with increasing temperatures until it becomes rather excessive at temperatures over 2150°F.

Fine-grain material is stronger for service at temperatures up to 1500°F. Fine-grain alloys will withstand more severe cold forming and thermal stresses due to quenching. They also possess greater resistance to carburization. Coarse-grain material, on the other hand, is stronger and exihibits superior creep and fatigue properties at the higher temperatures.

It is, or course, impractical to produce consistently and to stock fine or coarse grain material. There would probably be more failures due to mixups than if no attention were paid to grain size at all. The aim, therefore, in RA-330 has been to control grain size at an intermediate range so that optimum conditions are approached for all operations.

Carbon distribution is an important factor in all austenitic alloys because of its effect on strength and ductility. Thus, carbon is one of the primary reasons for annealing. Properly annealed 330, in which carbon is completely in solution, develops the optimum combination of strength, ductility and oxidation resistance.

If heat-resistant alloy material is subjected to intermediate temperatures of about 1100° to 1500°F for sustained periods, carbon will have a tendency to come out of solution and precipitate along grain boundaries. This precipitate usually forms a continuous network around each grain. This reduces ductility and impact strength. Reannealing restores the metal to its original condition without any detrimental e-



RA-330 ALLOY in formed sections and expanded metal stands up well in rotary hearth carbonitriding furnace. Tray and work quenched in oil, or work is emptied in water quench.

PHYSICAL AND MECHANICAL PROPERTIES OF RA-330

Composition: 0.20 max. C, 2.00 max. Mn, 0.75-1.50 Si, 14.5-16.5 Cr 34.0-37.0 Ni
Density: 0.286 lb per cu in.
Mean Coefficient of Expansion: 32° to 1800° F, 9.6 x 10^{-6} in. per in. per °F
Maximum constant temperature without excessive scaling: 1950° F
Melting range: 2550° to 2650° F
Average mechanical properties at room temperature:

	Annealed Sheet and Strip	Annealed Bars
Tensile strength, psi	70,000	80,000
Yield strength, psi	35,000	40,000
Elongation, pct in 2 in.	30.0	30.0
Hardness, Rb max.	85	90
Cold bend, °min.	180	—

Mechanical properties of annealed bars at elevated temperatures:

	1200° F	1400° F	1600° F	1800° F
Tensile strength, psi	65,900	60,000	28,100	14,700
Elongation, pct in 2 in.	31	21	21	43
Reduction of area, pct	28	24	24	40

RECOMMENDED DESIGN STRESSES FOR RA-330

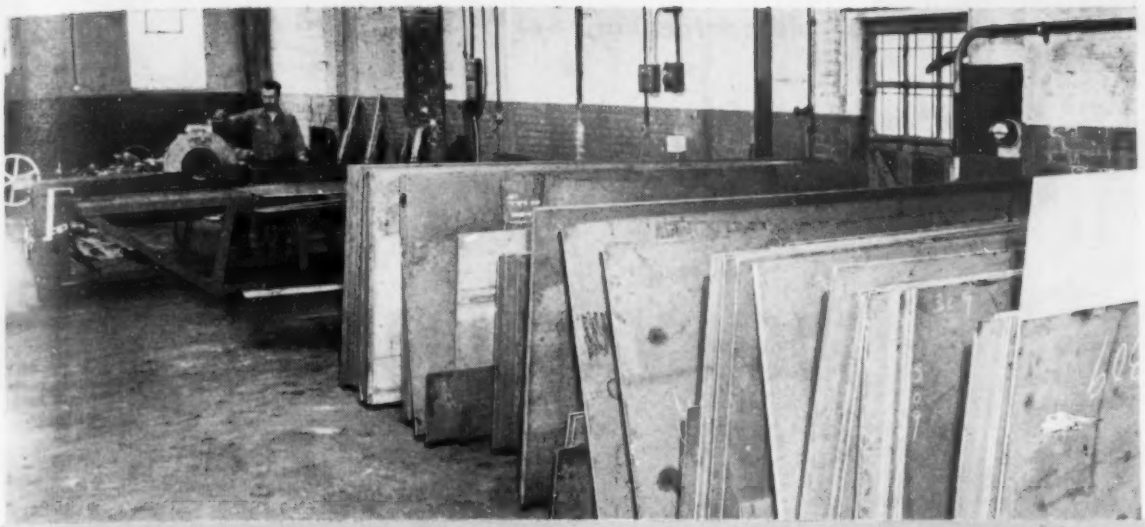
Direct Tensile and Compressive Stress, psi

Temp., °F	Condition A	Condition B	Condition C
1450	3300	3000	1800
1500	2800	2500	1500
1550	2350	2000	1200
1600	2000	1500	900
1650	1650	1150	700
1700	1280	800	480
1750	950	600	360
1800	650	420	250
1850	450	300	180
1900	315	220	130
1950	240	160	99
2000	180	120	70
2050	130	100	50
2100	100	80	40

Condition A: Accessible parts, no impact, slow temperature variation.
Condition B: Inaccessible parts or cyclic heating with air quench.
Condition C: Impact loads, thermal shock, liquid quench.

Designs should be based on maximum operating temperature of alloy Above stresses are for exial loads. Designs should follow accepted structura principles.

For bending stresses, beams, etc. . . . add 25 pct
For shear members, pins, rivets . . . reduce 25 pct
Bearing stress in pins, plates . . . reduce 25 pct



ANALYSIS and heat number identifies each plate of heat-resistant alloy in storage rack.

Abrasive saw in background permits cutting narrow widths without producing camber or twist.

fects whatsoever, providing no breaks were initiated while it was embrittled.

Carbides will also precipitate at temperatures between 1500°F and 1650°F, but at these temperatures the reaction is such that they tend to agglomerate rather than form a continuous network. The results of such precipitation are not nearly so detrimental as carbide network at grain boundaries.

Surprise is sometimes registered at alloy 330 being embrittled by carbide precipitation since it is a heat-resisting alloy. Both 330 and 310 alloys resist embrittlement better than other Cr-Ni alloys, and are stronger, even when precipitated, but neither is immune to the phenomenon.

Sigma formation is not a problem in alloy 330 since the nickel is sufficiently high and the chromium sufficiently low so that this phase will not form. Ordinarily, chromium has to be in excess of 22 to 23 pct before sigma phase appears, but if silicon is raised to 2 or 3 pct, sigma phase can exist with only 18 to 19 pct Cr.

Perform well at lower temperatures

Alloy 330 is primarily an alloy to withstand high heat and is most effective when used in the range 1500° to 2150°F. The alloy may be used up to 1900°F in oxidizing atmospheres and up to 2150°F in neutral or reducing atmospheres free of sulfur. At these temperatures, alloy 330 offers the greatest strength and endurance of the standardized heat-resisting alloys. At lower temperatures, lower cost alloys usually perform just as well and are, therefore, recommended. Also, in strongly oxidizing atmospheres above 1900°F, or if extremely high resistance to sulfur attack is required, higher chromium alloys should be used.

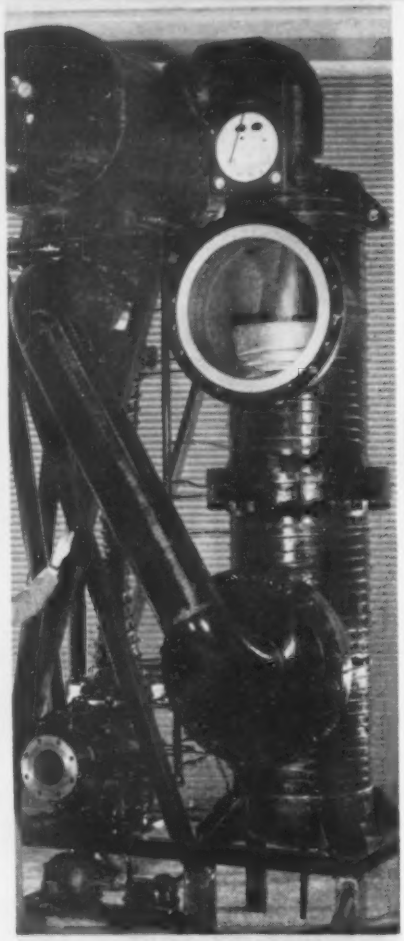
For fabrication of furnace parts, structurals, or fixtures where there is a heavy load carrying capacity, alloy 330 is quite advantageous. Strength requirements can be met with the greatest savings in weight and material. For heat treating trays and fixtures where the material is subjected to repeated heating and cooling cycles, possibly involving quenching, RA-330 is an outstanding alloy. Its combination of high strength and low expansion can better withstand the thermal stresses that are set up. These stresses may be many times the actual physical load. This alloy minimizes warpage and cracking in such applications.

For strongly carburizing conditions, such as in furnace parts, retorts, baskets or trays, RA-330 is an excellent material. However, if a combination of strongly carburizing conditions and temperatures in excess of 1750°F are encountered, the higher nickel alloys may be used with slight advantage.

An understanding of the influence of each alloying element makes it easier to evaluate the properties of other heat-resisting alloys. AISI 310 and 309 alloys are also austenitic when properly annealed and possess excellent high-temperature strength. Both have good resistance to scaling in oxidizing atmospheres up to 2000°F.

Although Type 310 is used primarily in oxidizing conditions, it has fair resistance to carburization and is preferred over higher nickel alloys for carburizing conditions when sulfur is present.

To promote better understanding of the merits of five easily obtainable heat-resistant alloys, and to encourage their use in high-temperature equipment, Rolled Alloys, Inc., Detroit, recently sponsored a panel meeting for fabricators of such alloys. Discussion of properties of these alloys was presented by Charles H. Emery, metallurgist, Simonds Saw and Steel Co., and Kenneth Metcalf, chief metallurgist, Universal Div., Universal Cyclops Steel Corp. Their remarks were based on extensive experience in the production and application of these materials.



TWO-STAGE oil ejector pump used to evacuate high vacuum furnaces. It has a speed of about 500 liters per second at 50 microns and an ultimate vacuum in the range of 1 to 5 microns.

Avoid contamination—

HIGH VACUUM EQUIPMENT: Pumping Systems

By G. P. Gerow
Supervisor
Vacuum Equipment Research
Consolidated Vacuum Corp.
Rochester

◆ Selection of the proper pumping system and components is of major importance in high vacuum melting . . . Equally important is the placing of the components in the system.

◆ For operating in the general pressure range, an oil-vapor ejector supported by a mechanical forepump is favored . . . To reduce pump downtime in rapid batch processing a roughing pump may be added . . . Steam ejectors are desirable if contamination is a problem.

◆ Gasketing of high vacuum equipment requires considerable care . . . Flanges should be kept clean . . . Welds are best made on the outside of the system.

◆ MANY METALLURGICAL PROCESSES carried on under high vacuum require a reduction in atmospheric pressure in the range from 1 mm down to 1 micron of mercury, and sometimes lower. To acquire such high vacuum, selection of the proper pumping system will depend primarily on five major process specifications. These include (1) the lowest pressure which must be obtained, (2) average operating pressure desired, (3) average gas load, (4) maximum load and pressure allowable, and (5) allowable pump downtime, which generally applies only to batch processes.

The gas load, i. e., the quantity of gas that must be removed per unit of time, is usually expressed in liter microns per second or micron cubic feet per minute. Pump speed is expressed in liters per second or cubic feet per minute. The load may be converted into volume per unit time by dividing by pressure. The gas load includes gas liberated during chemical reactions, dissolved gas liberated from solution, and any in leakage gas.

The quantity of gas liberated during a chemical reaction can be calculated in pounds per hour. The conversion factor from pounds per hour to liter microns per second is 80,000 for air. For other gases this figure may be modified according to molecular weight. For example, to convert from liter microns per second of water vapor to pounds per hours, multiply 80,000 by 29 and divide by 18.

The outgassing load of the charge and the optimum operating pressure must be determined experimentally. Inleakage of gas can be practically eliminated with the modern leak detector. The proper size of vacuum pump may be determined from the manufacturer's literature.

For operating in this general pressure range, the favored vacuum pump is the oil-vapor ejector, supported by a mechanical forepump. Mechanical pumps and steam ejectors generally are not as

Require Close Attention

efficient below 1 mm, and diffusion pumps generally do not operate well above 1 micron.

In the oil ejector, oil vapor generated in a boiler is expanded through a nozzle to attain high velocity. This vapor entrains air, which is passed through a converging section called the diffusor. Air is compressed for the forepump intake while the oil vapor is condensed and returned to the boiler.

The forepump usually is a rotary oil-sealed mechanical pump. In some larger high-vacuum systems, it is desirable and more economical to use an extra oil-ejector stage, with a smaller mechanical pump, rather than a single large mechanical pump.

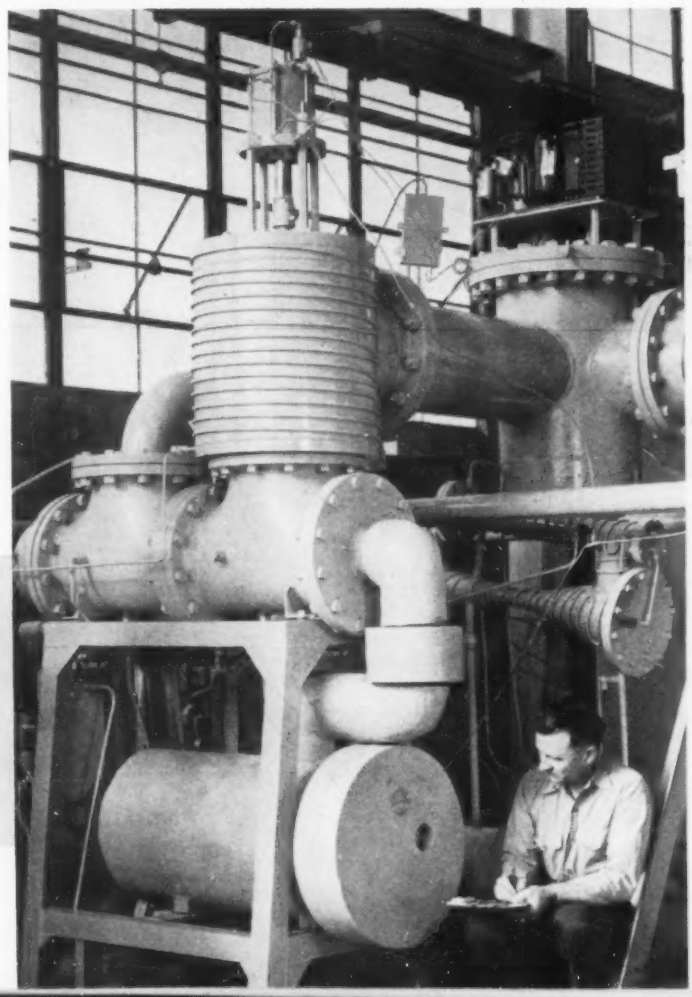
A bypass usually is provided so that the forepump may be used for pumping down the system while a small holding pump maintains the vacuum on the oil-vapor pump. This bypass may be eliminated if sufficient time is allowed for the oil vapor pump to heat up.

For rapid batch processing, a large mechanical pump, called a roughing pump, may be added to the system to reduce the time of pumping. This pump is cut out of the system during final pumping and processing.

If water or other condensable vapors are encountered in the process the mechanical pump must be derated accordingly, or means provided for cleaning the oil. These may be either a heated separator tank, or an oil purification system.

If contamination is severe, or if it is of abrasive nature, use of a steam ejector may be advisable. However, a steam ejector seriously limits portability of the unit. If portability is essential, a dust trap may be inserted in the line to the mechanical pump to reduce abrasive contamination. Such dust traps reduce the speed of the mechanical pump by several factors and must therefore be used with discretion.

Proper placing of the components of a high-vacuum system is equally as critical as correct selection because resistance to flow under high vacuum is very important. The most satisfactory method is to place the vacuum pumps next to the



SINGLE-STAGE oil ejector vacuum pumps, operating in series. Large pump has a speed of about 1500 liters per second at 50 microns and an ultimate vacuum of 1 to 5 microns. Tilted horizontal apparatus, center, is a smaller pump with a speed of about 300 liters per second at 250 microns. In this installation it is serving as a forepump for the large pump.

system before adding accessory components. Vacuum lines should be of the largest practical diameter, and as short as possible. For ejector work, lines may be the intake size of the pump if they do not exceed a few diameters in length.

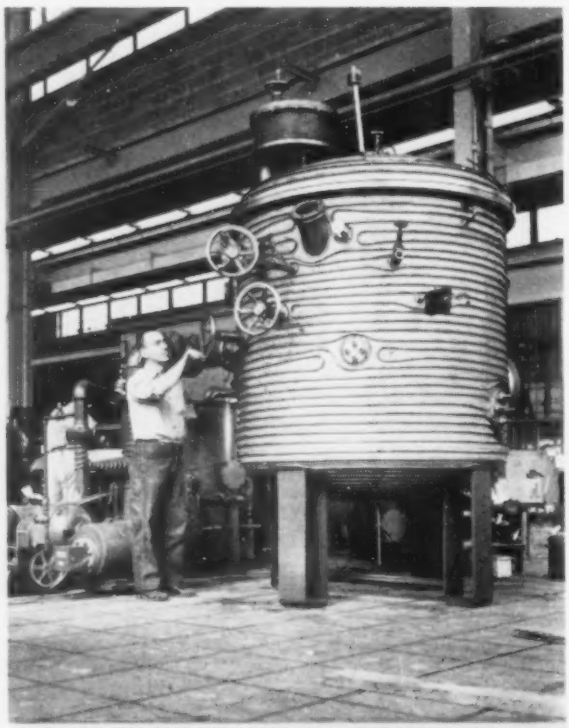
If it is impractical to maintain the normal circular cross-section of the paths from the pumps, the cross-section should be of equivalent area. If the pumping lines are very long, it may be necessary to increase the line diameter over the pump size.

Valves designed especially for high-vacuum installations are highly recommended. Several styles of high-vacuum valves are designed to provide large straight-through port openings which offer minimum resistance to gas flow.

In small sizes, the stem seal is generally a bellows, or diaphragm. Larger valves usually have "O" rings in a special vacuum lubricant as a stem seal, because of the difficulty of obtaining suitable bellows for long stem travels.

Small valves are normally of standard globe-valve design. Large valves are also made in globe-valve construction, but various types of gate and butterfly valves are usually used since they offer less impedance to gas flow. Neoprene gaskets are commonly used for valve seats.

Gasketing of high-vacuum equipment requires considerable care. Unless the proper gaskets are used correctly, joints will leak. Cleanliness is of utmost importance. The proper gasket, in the right place, may still leak if the gasket groove has not been properly cleaned.



HIGH-VACUUM melting and casting furnace (66 in.) operating at vacuum of 10 microns. Capacity is about 200 to 300 lb of melt.

Full-face gaskets are not recommended because they are not reliable. Limited-compression gaskets, either of the O-ring type, or of the flat gasket contained in a groove, with approximately 20 pct compression, are preferred. Hycar or Neoprene "O" rings of approximately 60 durometer can be obtained in diameters as large as 16 in. "O" rings larger than 16 in. can be made from long lengths of round Neoprene material. Joints in such gaskets should be vulcanized.

Where the gasket groove may be located in the bottom flange of a horizontal joint, the groove may be rectangular. It should be approximately 1/16 in. wider than the "O" ring, and have a depth 75 pct of the "O"-ring cross-section.

Little lubricant needed

If the gasket is to be used in the vertical or upside-down position, the groove should have a 15° chamfer on the inside edge, and the inside diameter should be enough larger than the inside diameter of the "O" ring to stretch the ring 6 pct. A 32 microinch finish is desirable for both the flat flange face and the bottom of the groove, and a 1/64 in. radius should be used on all corners of the groove to prevent cutting the gasket.

Gaskets should generally be installed nearly dry, and the flanges pulled up, metal to metal. Sometimes gaskets are wet with a vacuum grease or hydrocarbon pump fluid, and then wiped as dry as possible. The remaining lubricant helps the gasket to seal small surface irregularities, and aids in preventing crushing of the gasket.

Welds on outside only

Good welding of vacuum equipment is usually difficult even for experienced welders. However, tight welds may be made consistently if the weld area is well cleaned, the flux chipped carefully between weld passes, and the weld puddled well at both the start and end of each rod.

It is best to make welds on the outside of the system only. If the weld is made on both sides of the wall, the pocket between may leak into the system. In any case, detection of a leak in a double-welded system is extremely difficult. It may be permissible to overlay the weld material with brazing rod to close leaks.

With modern leak detectors, inleakage of gas can be practically eliminated. Leak detection of a system should be started in the component stage. If construction personnel are unfamiliar with high-vacuum work, it would be well to start leak detection by painting the outside of the components with a soap solution, then applying air pressure to the inside and observing leakage by the formation of bubbles. The component should also be checked with a helium mass spectrometer or halogen sensitive detector.

After the components are assembled, the whole system should be checked for leaks before paint is applied. Paint may seal a leak temporarily.

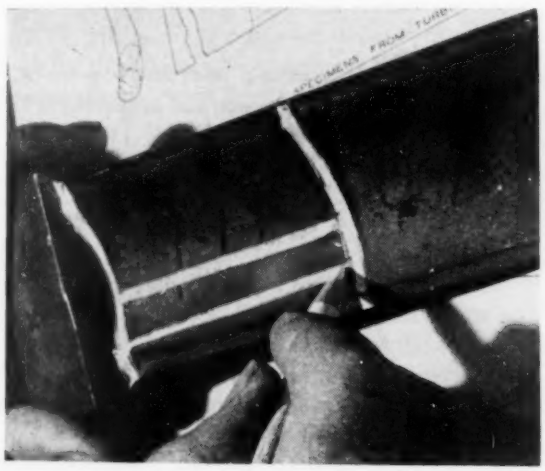
Stress-Rupture Test Guarantees Jet Engine Parts

♦ SUCCESSFUL operation of today's jet engines with their high heats and speeds is backed by careful and continuing quality control. Metal alloys must retain their properties while resisting tremendous quantities of heat, gas pressure and centrifugal force. As part of a rigid quality control, program to assure meeting these needs, technicians at Pratt & Whitney Aircraft, East Hartford, Conn., simulate operating conditions within a jet engine.

Under controlled heat and weight, they stress metal to the rupture point while studying increasing strains electronically. Specimens are of high temperature alloys taken at random from turbine disks and blade blank forgings.

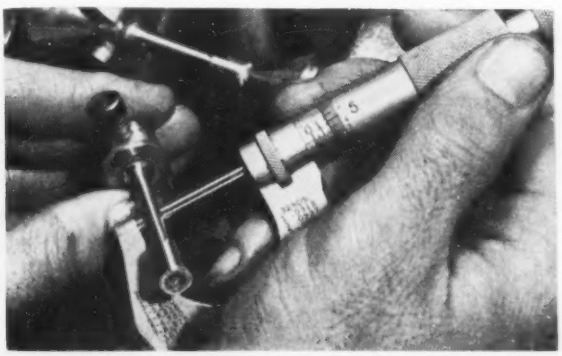
The rupture tests, conducted in a small electric furnace, may range from 15 to 100 hours. Temperatures run from 1200° to 1500°F. Loads may reach 65,000 psi. Thermocouple wires attached to the test specimen take the "pulse" of the metal while under test.

If the metal specimen, after rupture is found to have resisted "creep" and held its strength under time and temperature tests, the alloy is good and the other forgings from the same mill heat can be machined.

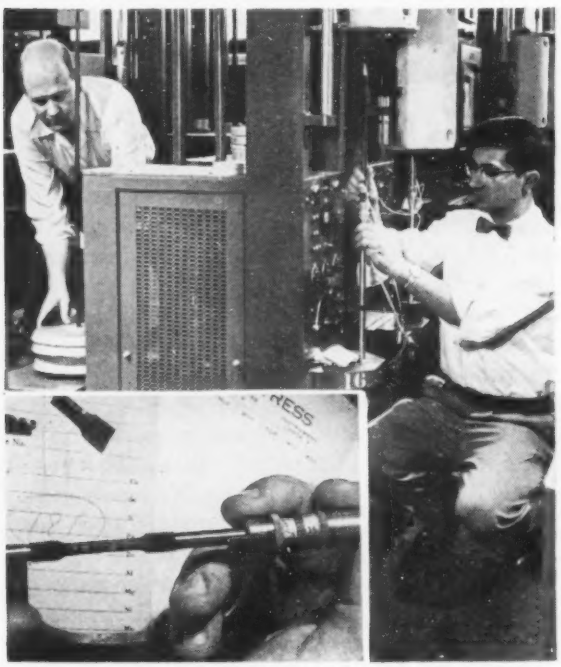


SMALL AREA on turbine blade forging blank is marked off to obtain test piece.

TEST SECTION from high alloy heat resistant blank is carefully cut out on lathe.



AFTER GRINDING, test specimen is checked for size to assure accuracy of test results.



TEST RIG gets final adjustments . After rupture, pieces are forced together, elongation measured.

Austenite conversion—

HOW COLD WORK, HEAT TREAT Change Properties of 18-8 Wire

Samuel Storchheim
Metallurgical Engineer
Rego Park, N. Y.

◆ Percentage of cold reduction and heat treating temperatures can sharply change the electrical properties of 18-8 stainless wire . . . Basic to these changes is the conversion of austenite to martensite . . . Carbon content may be tied to remanence of heat-treated wires.

◆ MARKED DIFFERENCES in electrical properties of heat-treated 18-8 stainless steel wire are tied to varying heat treatment and percentages of cold reduction, recent studies have found. This phenomenon, involving conversion of paramagnetic austenite to ferromagnetic martensite through cold reduction has previously been used to produce magnetic recording wire.

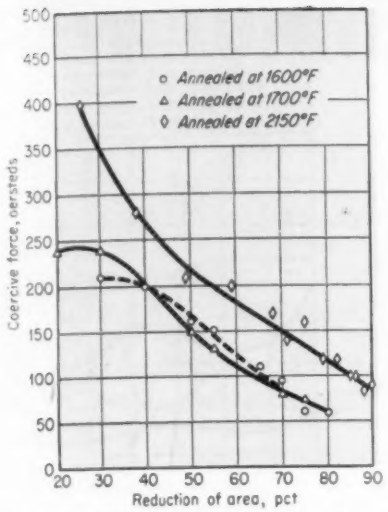
To more accurately determine the effects of cold reduction and heat treatment on conversion of austenite to martensite in typical 18-8 stainless steel wires, the Wilbur B. Driver Co., of Newark, N. J., recently instituted an extensive research program.

Two commercial melts of 18-8 stainless steel, types 302 and 304, Table I, were cold-worked to produce maximum martensite. Increasing percentages of cold-reduction cause an increase in the remanence of stainless wires, and a decrease in coercive force.[1, 2] In addition, prior annealing temperature affects the curve generated. The lower the prior anneal, the more rapid is the conversion of austenite to martensite. Wires used in this study were annealed at 1225°F. The wire was stranded through a horizontal tube furnace in a cracked ammonia atmosphere. Wire was in the furnace hot zone for 9 seconds.

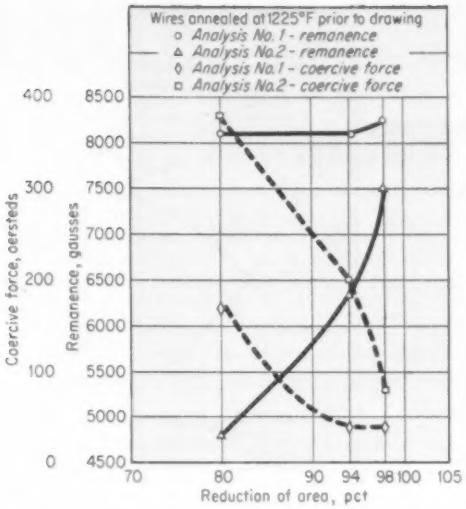
Normally, annealing stainless steel wire in the martensitic condition converts all martensite to austenite causing the wire to lose all magnetism. Here, the low annealing temperature only partially converted austenite to martensite, leaving the wires in an intermediate ferromagnetic condition but softened sufficiently for futher drawing. Table II shows the magnetic measurements of these partial annealed wires at various stages of cold-reduction. Magnetic measurements were made by projecting the hysteresis loop of the wire upon the screen of a cathode-ray oscilloscope. These images were measured for coercive force, Hc, and remanence, Br.

The effect of cold-reduction on magnetic parameters of wires annealed at 1225°F was plotted. The remanence curve for analysis No. 1 is almost horizontal, indicating the wire had almost developed its maximum Br even at the lowest (80 pct) reduction used. Analysis No. 2 showed an increase of remanence as the cold-reduction of area increased.

The slightly higher nickel content probably prevented attainment of maximum Br at both the lowest and highest (98 pct) cold-reduction used. This is in keeping with available knowledge of the austenite to martensite conversion, that is, nickel as well as manganese and carbon retard this conversion. Niobium, molybdenum, silicon and chromium aid the transformation



COERCIVE FORCE slopes off in stainless 18-8 wires with an increasing reduction of area.

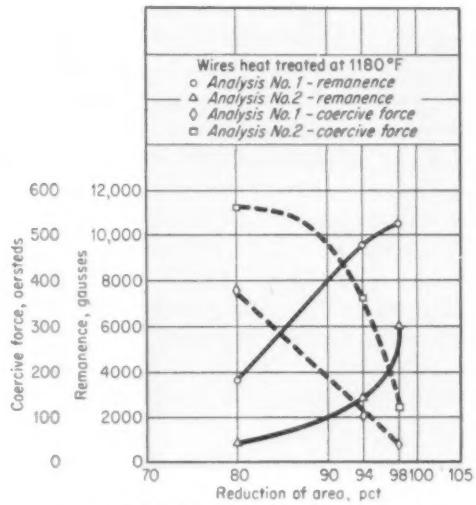

Wires annealed at 1225°F prior to drawing
Analysis No. 1 - remanence
Analysis No.2 - remanence
Analysis No.1 - coercive force
Analysis No.2 - coercive force
Coercive force, oersteds
Remanence, gausses
Reduction of area, pct

EFFECT of cold reduction on stainless wire annealed at 1225°F prior to drawing operation.

from austenite to martensite. The coercive force curves show a typical decrease with increasing cold-reduction. Higher coercive forces are associated with lower remanences, which in turn are associated with higher nickel contents.

The above wires were then further reduced and heat-treated at increasing temperatures. Remanence curves for 0.004 in. wires cold-drawn at various percentages of reduction of area and heat-treated at 1180°F for 9 seconds are generally typical of curves for cold-drawn wires not heat-treated.

The curve for analysis 1, shows an increase in remanence as cold-reduction increases. Severely cold worked wires, 94 and 98 pct


Wires heat treated at 1180°F
Analysis No. 1 - remanence
Analysis No.2 - remanence
Analysis No.1 - coercive force
Analysis No.2 - coercive force
Coercive force, oersteds
Remanence, gausses
Reduction of area, pct

COERCIVE FORCE falls, remanence rises in 18-8 wires cold reduced, heat treated at 1180°F.

TABLE I

ANALYSES OF STEELS USED

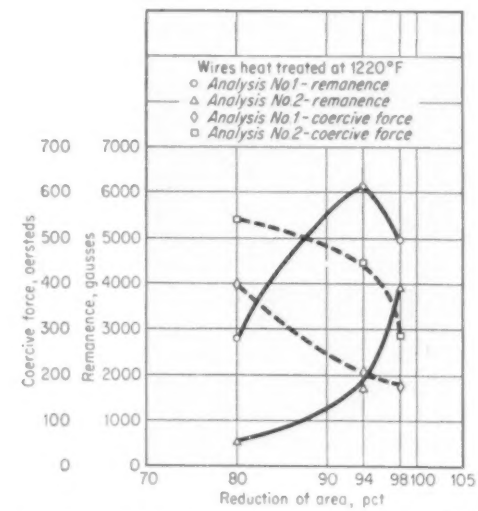
Analysis No.	'Stainless' Type	Ni	Cr	Mn	Si	C	M Approx.	Fe
1	302	9.01	18.62	0.89	0.42	0.100		balance
2	304	9.11	18.77	0.56	0.55	0.065	0.34	balance

TABLE II

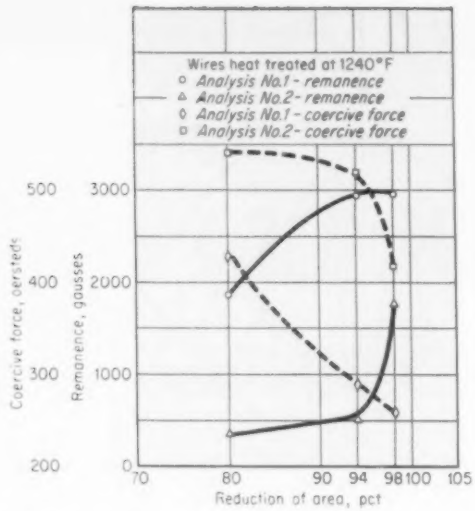
MAGNETIC MEASUREMENTS*

Reduction, Pct	Coercive Force Oersteds	Remanence Gausses
	Analysis No. 1	
98	160	7500
90	160	3250
67	220	500
	Analysis No. 2	
98	300	3240
90	180	2750
67	520	200

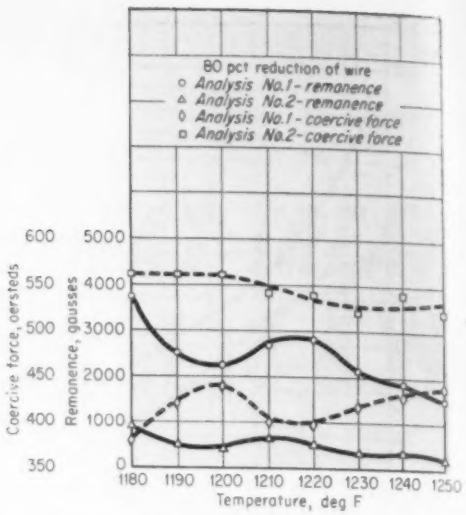
* Partially annealed at 1225° F.



SHARP BREAK in remanence of analysis sample is noted in wire at 94 pct reduction.


Wires heat treated at 1240°F
Analysis No.1 - remanence
Analysis No.2 - remanence
Analysis No.1 - coercive force
Analysis No.2 - coercive force
Coercive force, oersteds
Remanence, gausses
Reduction of area, pct

SIMILAR TESTS for remanence and coercive force were made for heat treated 18-8.



MAGNETIC PROPERTIES after heat treatment of the wires with an 80 pct reduction of area.

reduction, show higher remanence than wires cold-reduced and not heat-treated. While heat-treatment converts martensite to austenite, and reduces ferromagnesium, in wires representing very high remanences carbon probably precipitates out of solution at this temperature as chrome carbide leaving behind highly ferromagnetic domains of nickel-iron.

Remanence developed for analysis 2 is lower in all cases than for analysis 1. At no time is the remanence of the heat-treated wire higher than that of the non-heat-treated wire. Lower values are explained by lower initial cold-work remanences as compared with wires from analysis 1.

If the projection regarding chrome carbide precipitation is valid, then the reason remanences of the heat-treated wire of analysis 2 were less than those of cold-worked wire lies in the alloy's carbon content. The considerably greater carbon content of analysis 1 would tie up more chrome as chrome carbide, leaving behind more highly ferromagnetic nickel-iron domains.

Coercive force curves for wires heat-treated at 1180°F show a decline with increasing cold-reduction of area. Coercive force developed is greater in analysis 2, a factor associated with lower remanence values. Coercive force increases as martensite is converted to austenite. The exception is where carbide precipitation has occurred, as in analysis 1 at 98 pct reduction of area. The coercive force, here remains the same as for wire in the cold-drawn condition. That is, where maximum effect of carbide precipitation is observed, remanence increases to a high value, while coercive force apparently remains about the same.

With 0.004 in. diam wire heat-treated at 1220°F for 9 seconds remanence shows an initial general rise. This is followed by a decrease for analysis 1 at 98 pct reduction of area. Both remanence curves are now considerably below values for cold-worked wires. The curve for analysis 2 is again below that of analysis 1. Coercive force curves decrease with increasing cold-reduction, and coercive force values are now considerably higher than those obtained from cold-worked wires.

Wires were then heat-treated at 1240°F. Both remanence curves increase with increasing per cent reduction. The curve for analysis 2, again falls below that of analysis 1, and both curves show rather low Br values. Conversion of martensite to austenite is approaching an end. Coercive force curves also decrease with increasing reduction of area. Again, analysis 2 shows coercive force values as high as 540 oersteds.

Heat treat vs. electrical properties

Magnetic properties as a function of heat-treatment of wires originally reduced 80 pct in area were studied. A difference in the locations and slopes of the curves as caused by chemical analysis was found. Remanence curve of analysis 1 shows higher heat-treated Br's than that of analysis 2. Rate of decline of remanence appears to be less for analysis 2.

Coercive force curves exhibit somewhat inverted trends. The curve for analysis 2 is the higher of the two. Analysis 1 curve increases in coercive force with increasing temperature of heat-treatment, while the curve for analysis 2 falls in Hc with temperature rise.

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[1] S. Storcheim, "Permanent Magnetic Properties in 18/8," Iron Age, Feb.. 12, 1953.

[2] S. Storcheim, "How Heat Treatment Affects Properties of Cold Worked 18/8 Wire," Iron Age, Oct. 1, 1953.

NEW TUNNEL FURNACE Saves Fuel, Manpower

♦ REHEATING STEEL billets prior to hot working will be done in a new tunnel-type furnace recently installed at the Canton, Ohio, plant of Timken Roller Bearing Co. Although used extensively in the ceramic industry, the tunnel-type furnace with its continuously moving hearth is an innovation in steel treating.

Estimated to cost $500,000, the heating capacity of the new unit will be 50 tons per hr. Roll down furnaces, which the tunnel furnace replaces, required 2,900,000 Btu per ton of steel heated. The new furnace is expected to reduce this figure by 20 pct, and scale loss will also be greatly decreased.

Formerly, 7 men were needed to operate the firm's roll down furnaces, but only 2 men will be required for the new type.

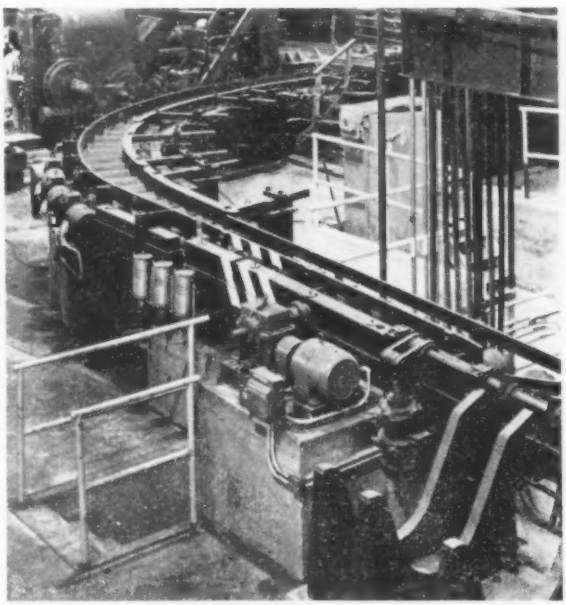
Temperature, air-fuel ratio and furnace atmosphere pressure are controlled automatically. Billets are automatically charged into the furnace one or two at a time, by means of a tong-type charging machine. Thus single or double rows of billets are carried through the furnace on cars 12 ft wide and 11 ft 9 in. long, at adjustable speeds from 6 to 32 in. pr min.

Eleven moving cars form the hearth of the furnace. They move through three heating zones which can be adjusted in temperature, the final zone capable of heating billets to 2300°F. The furnace is equipped with 34 burners and can use either gas or oil. It will use gas primarily, with oil as the standby fuel.

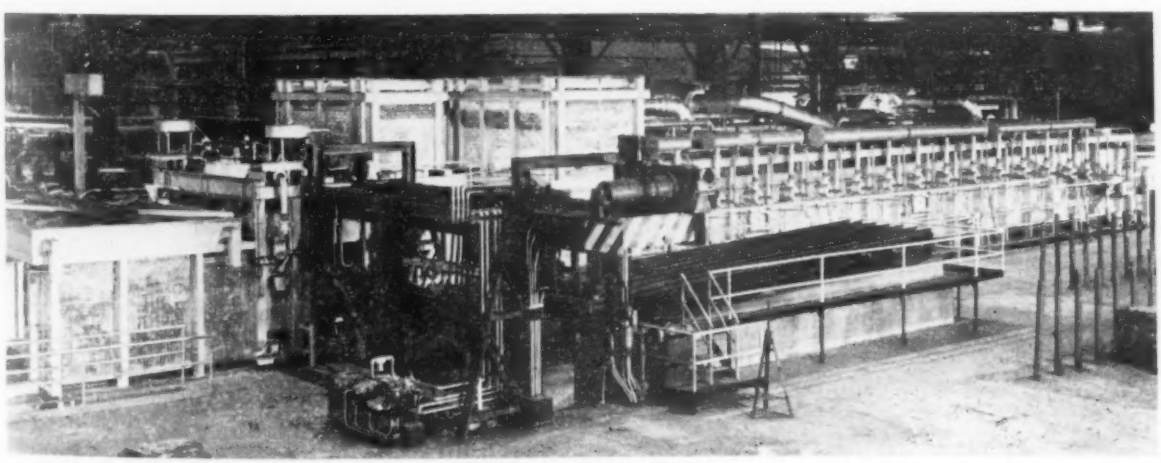
The cars are discharged by a manually-controlled machine and pulled onto an exit lift by a hydraulically-operated car separator. From this point each car is lowered to a level beneath the furnace and returned by a dolly to the charging end. Here again it is hydraulically elevated to charging level, and the cycle is completed.

The hydraulic lifts and car separator are operated by a 200 psi hydraulic system supplied by a 40-hp pump. A 15-hp pump supplies 800 psi hydraulic pressure to the under car puller which moves cars through the furnace. The charging and discharging machines each have a 650 psi system powered by 15-hp motors.

Distance between charging and discharging doors is 108 ft; hearth width is 12 ft. Overall furnace length, including lifts and vestibules at either end, is 148 ft.



HEATED billets are transferred from discharged tunnel furnace cars to this roller conveyor.



CHARGING equipment is shown, foreground, in this view of new tunnel-type billet furnace.

Small steel parts—

MECHANIZED Hard Chrome Plating Setup

By Herbert Chase
Consultant
Forest Hills, N. Y.

◆ Mass production of spindles from C1117 bar stock calls for a fast, efficient plating setup to handle the parts flow . . . An automatic conveyorized installation at Harvester's Evansville, Ind. Works does the job around the clock . . . Bonus factor is a very low reject rate.

◆ SURPRISINGLY ENOUGH, the steel spindles, or cotton-picking "fingers" of a modern International Harvester Cotton Picker are subjected to considerable abrasive action from contact with cotton bolls. Resistance to this abrasion is provided by hard chromium plating the exposed ends of the spindles to a thickness of 0.0004 to 0.0006 in.

Such plating is not uncommon on special tools or other parts that are not mass produced. But since there is a total of 1020 spindles in each cotton picking machine, engineers at International Harvester's Evansville, Ind. Works had a real production plating problem to solve.

Spindles are machined from C1117 steel bar stock, with the exposed or "picking" end in the form of a barbed taper. The parts are heat treated before being sent to the plating department.

A lot of experimental work was required before this operation attained rapid and consistant results. It now plates an average of 642 spindles per hour with a reject rate of less than 0.25 pct. Statistical quality control, using a chart such as appears in the photograph, helps to hold rejects at a minimum.

Plating is done in a Daw machine, using a single loading and unloading station. This machine does not use racks but its conveyor carries spring clips, each of which holds one spindle during the complete plating cycle.

Only the tapered end of each spindle is plated. This is done by vertical racking and control of the part depth in the plating solution. The upper spindle section, including the bearing journal and bevel gear, are not exposed to the cotton bolls and are not plated.

Spindles to be plated are taken by hand from a skid box next to the operator who unloads, a plated spindle and loads an unplated spindle in each clip as it passes in front of him. Thereafter, plating is completely automatic and the parts are not touched by hand until they return to the operator station.

After loading, each spindle enters the first tank where it undergoes a 1.21-min electrolytic cleaning in a 185°F alkaline solution containing a wetting agent. A 6-v potential results in a current density of about 4 amp per sq in. In this first tank, spindles are submerged to a point above the area to be plated.

This cleaning is followed by a cold water rinse and then by a 1.21-min electrolytic pickle in a 55-pct (by volume) muriatic acid solution at room temperature. Current density averages about 2 to 2.5 amp per sq in. Next, comes a cold spray rinse and then a 0.67-min reverse etch in a solution containing 33 oz per gal of chromic acid and 0.33 oz per gal of sulfuric acid heated at 155° to 170° F. A 6-v potential

Editor's Note: Mr. Chase, a well known consultant and journalist, has contributed many technical articles to engineering publications.

is Fast and Efficient

is applied during this etch which prepares the spindles for plating.

Plating is done in a solution containing 33 oz of chromic acid and 0.33 oz of sulfuric acid per gal, heated to 143° F. Current density is 3 amp per sq. in. Electronic controls are used to hold the temperature and solution level constant. Spindles are immersed to a point only slightly above the tapered section.

It requires 21.23 min. for the parts to traverse the 82½-ft conveyor from start to finish, during which time a 0.0004 to 0.0006-in. hard chrome deposit is built up.

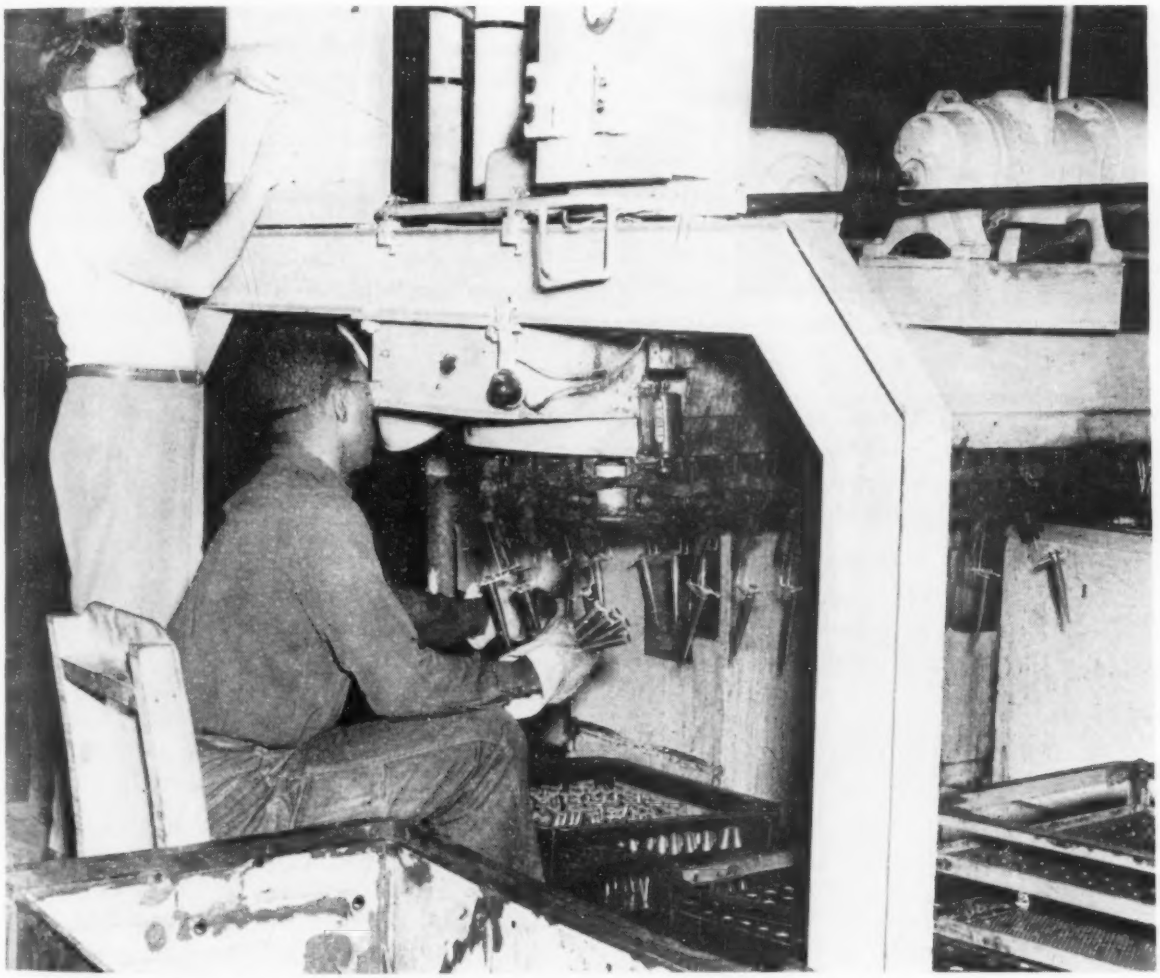
The plating solution is deionized, and this, together with the controls mentioned and the care used in preparing the parts for plating, is primarily responsible for the success and uniformity achieved.

A spray rinse follows plating and returns to the dragout from which most of the chromic acid is salvaged. Two cold rinses and a hot rinse follow the spray rinse. The plated spindles pass through a 155° to 160°F hot air blow-off, and are dry when they reach the unloading station.

As the spindles are unloaded from the clips they are visually inspected. Parts passing inspection are set in racks for transfer to assembly lines. Rejects are stripped and replated.

Some indication of the success of this setup is found in the low reject rate, already mentioned, and in the fact that the installation has operated for some 6 years on 24-hr-a-day basis. High quality plating specifications have been constantly maintained.

Only one man operates the machine. Another makes solutions additions and checks controls. Quality control measures include spot checks on plating. This is done by an inspector who devotes only part of his time to this.



ONE OPERATOR loads and unloads spindles from Daw automatic plating machine while another checks quality control chart. The machine plates 642 pieces per hour. Reject rate is less than ¼ pct. The 0.0004 to 0.0006 in. deposit protects cotton picking fingers against wear.

FRICTION SAWING...

By H. J. Chamberland
Field Engineer
The DoAll Co.
Des Plaines, Ill.

◆ High cost metalworking cut-off operations can be brought back in line by putting friction sawing to work in your plant . . . Band friction sawing is one of the most rapid methods of cutting ferrous materials where thickness does not exceed 1 in.

◆ Machines have proved especially effective in foundries for removing gates and risers . . . Cutting rates of 60 linear ipm have been reached on 1/4-in. armor plate . . . Fixturing is needed for metals over 1 in. in thickness.

◆ SAVINGS possible through band friction cutting are often ignored in metalworking plants. The process can save many manhours by speeding sawing from five to fifty times in a great variety of metalworking jobs. Substantial increases in production and appreciable savings in downtime have been possible. The machines have been especially effective in foundries for removing gates and risers.

The friction sawing machine may be located either in the cut-off department or on the production line. Investment in this type equipment can be offset when the machine is used as little as 3 hours a day. One plant has applied its friction sawing machine profitably for as little as 20 hours a week to cut 3/4 in. stainless steel. An average cutting rate of 13 linear ipm is achieved as compared with a

Cuts Off High Costs

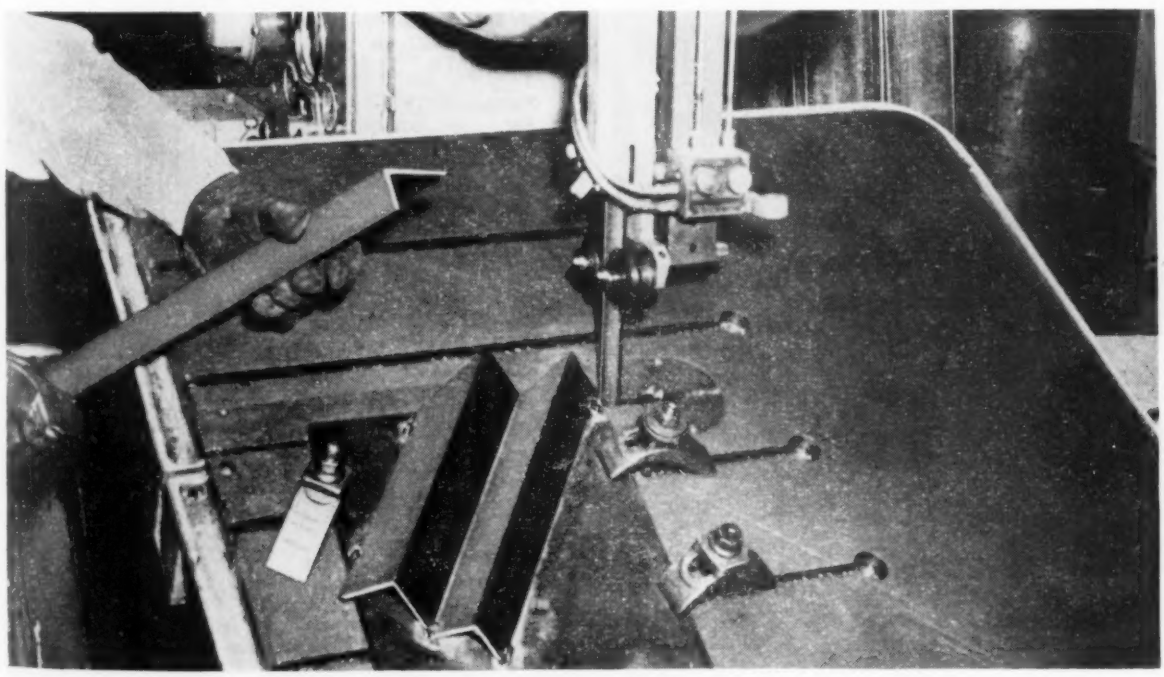
maximum of 1 linear ipm by conventional sawing.

Friction sawing by the band method is one of the most rapid methods of cutting ferrous materials where material thickness does not exceed 1 in. With proper fixturing to present a thick cutting edge to the saw blade at all times, the 1 in. limitation depends somewhat on the nature of the cut. Cutting rates, as shown in the accompanying chart, multiply rapidly as material thickness decreases to a point where a production rate of 60 linear ipm is feasible on ¼ in. armor plate.

Band friction sawing practice has reached a higher level of efficiency since development of a blade especially suited to friction sawing techniques. Through a unique heat treating process, the teeth remain permanently anchored and locked in place. Metallurgical characteristics of the band permit maximum flexing resulting in long uninterrupted sawing. This band is not recommended for conventional sawing.

A typical blade has tooth hardness and gullet depth similar to those of a conventional saw. It differs, however, in depth of tooth hardness and location at which the tooth is set. This special heat treatment is instrumental in keeping teeth permanently anchored in place.

Standard bands 1 or ¾ in. wide and of 10



SIMPLE, SHOP-MADE fixtures expedite cutting of these 2½ x 3 in. angles. Cutting time: 5 sec.

FRICTION CUTTING RATES AND SAW CONTROL FACTORS

MATERIALS	Saw Velocity Work Thickness			Saw Pitch Work Thickness			Approx. Lin. Cutting Rate, ipm Work Thickness				
	1/16-1/4 in.	1/4-1/2 in.	1/2-1 in.	1/16-1/4 in.	1/4-1/2 in.	1/2-1 in.	1/16 in.	1/4 in.	1/2 in.	3/4 in.	1 in.
Carbon Steel 1010-1095	6000	9000	12,500	14	10	10	1400	60	30	8	6
Manganese Steel T1330-1350	6000	9000	12,500	14	10	10	1200	55	25	7	5
Free Machining Steel X1112-X1340	6000	9000	12,500	14	10	10	1400	60	25	7	5
Nickel Steel 2015-2515	8000	12,000	14,000	14	10	10	800	45	20	5	3
Nickel Chromium Steel 3115-3415	8000	12,000	14,000	14	10	10	800	45	18	5	3
Molybdenum Steel 4023-4820	8000	12,000	14,000	14	10	10	1000	50	20	6	3
Chromium Steel 5120-5150	8000	12,000	14,000	14	10	10	800	45	18	5	3
Chromium Steel 51210-52100	8000	12,000	14,000	14	10	10	800	40	15	5	3
Chromium Vanadium 6115-6195	8000	12,000	14,000	14	10	10	700	40	15	5	3
Tungsten Steel 7260-71360	8000	12,000	14,000	14	10	10	600	38	12	4	3
Triple Alloy Steel 8024-8949	8000	12,000	14,000	14	10	10	800	45	20	6	3
Silicon Steel 9255-9260	8000	12,000	14,000	14	10	10	600	45	16	4	3
Armor Plate	7000	10,000	13,500	14	10	10	1200	60	30	6	5
Stainless Steel	7000	10,000	13,500	14	10	10	1200	60	30	8	6
Illium	8000	12,000	15,000	14	10	10	600	35	12	3	2
Cast Steel	7000	10,000	13,500	14	10	10	1000	50	16	7	5
Gray Cast Iron	7000	10,000	13,500	14	10	10	1000	55	20	7	5
Malleable Cast Iron	7000	10,000	13,500	14	10	10	1000	55	20	7	5
Meehanite Castings	7000	10,000	13,500	14	10	10	1000	55	20	7	5

pitch need not be scrapped just because they are no longer useful for low speed sawing. Hours and even days of friction sawing productiveness remain in such tools if the teeth are not stripped. Bands with stripped teeth are of minor value in generating the necessary frictional heat. Further, they keep the heat localized and prevent penetration on the side walls of the cut. It is for this reason that use of box strapping for friction sawing has proved impractical. Use of a properly designed saw blade substantially aids friction sawing efficiency.

Four Friction Sawing Case Histories

Plant "A"

MATERIAL: Tool steel 1/8 in. thick.

SAWING RECOMMENDATIONS	CONVENTIONAL SAWING	FRICTION SAWING
Saw Type	Precision	Friction
Saw Temper	A	A
Saw Set	0.042 in.	0.057 in.
Saw Pitch	18	14
Saw Width	1/2 in.	1 in.
Saw Velocity	50 fpm	9000
Feeding Pressure	Light, hand	Medium, hand
Cutting Rate	3 1/2 linear ipm	45 linear ipm

Plant "B"

MATERIAL: Monel sheets 0.130 in. thick.

SAWING RECOMMENDATIONS	CONVENTIONAL SAWING	FRICTION SAWING
Saw Type	Precision	Friction
Saw Temper	A	A
Saw Set	0.042 in.	0.054 in.
Saw Pitch	18	14
Saw Width	3/4 in.	3/4 in.
Saw Velocity	60 fpm	7000 fpm
Lubricant	Cutting oil	None
Feeding Pressure	40 lb	85 lb
Cutting Rate	7/8 linear ipm	50 linear ipm

Plant "C"

MATERIAL: Special 90 pct nickel alloy, 5/8 in. thick.

SAW AND CUTTING DATA	CONVENTIONAL SAWING	FRICTION SAWING
Type	Precision	Friction
Temper	A	A
Set	0.050 in.	0.057 in.
Pitch	10	10
Width	3/4 in.	1 in.
Velocity	60 fpm	12,000 fpm
Lubricant	Cutting oil (drip)	None
Feeding Pressure	35 pounds, hand	Heavy, hand
Cutting Rate	0.38 square ipm	10 square ipm

Plant "D"

MATERIAL: Chrome-vanadium steel, 5/16 in. thick.

SAW AND CUTTING DATA	CONVENTIONAL SAWING	FRICTION SAWING
Type	Precision	Friction
Temper	A	A
Set	0.055 in.	0.057 in.
Pitch	10	10
Width	3/4 in.	1 in.
Velocity	75 fpm	12,000
Lubricant	Cool Grinding Concentrate*	None
Feeding Pressure	Hydraulic, 30 units	Heavy, hand
Cutting Rate	1.34 square ipm	12.5 square ipm

* Mist lubrication developed by DoALL for use with surface grinding machines.

Case History IA-109

Here's what we mean by SUPERIOR ENGINEERED FOUNDRY PRODUCTS...

PROBLEM:

1. This 55-pound cast steel rear spring lock out beam was failing in service.
2. Because the design was not compatible with good foundry practice, it was impossible to consistently produce quality castings.
   (a) An excessive number of feeding risers was required to eliminate a shrinkage condition at the heavy rib junctions.
   (b) The long, deep, narrow pockets were the cause of sand being washed off and becoming trapped in the metal as the casting was being poured.

SOLUTION:

Stress analysis of the original design, in Superior's own stress analysis laboratory, revealed the stresses to be too high and the ribs to be stress risers. Therefore, the design must be modified in order to carry the service loads.

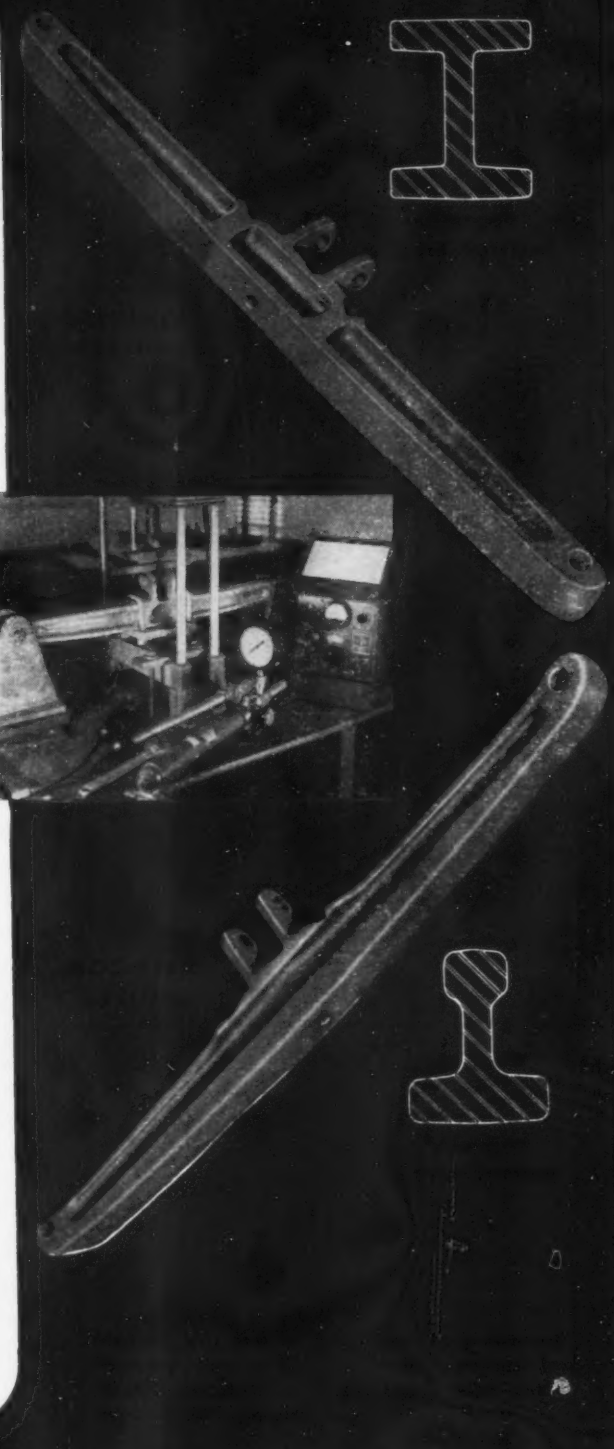
RESULT:

1. Superior's Engineered Foundry Design reduced the critical stress 57.5%, eliminating service failures. Strength was increased 235%, weight reduced 3.2 pounds.
2. The redesign is compatible with good foundry practice and enables the foundry to consistently produce castings that meet the high standards required.
   (a) Elimination of the heavy rib junctions reduces the number of feeding risers required to produce sound castings.
   (b) Trapping of sand in the metal during pouring is prevented because the deep pockets have been reduced.

IT PAYS TO PAY ATTENTION TO CASTING DESIGN

YOU, TOO, CAN BENEFIT BY CONSULTING SUPERIOR'S PRODUCT DEVELOPMENT SERVICE.

If it can be cast, Superior's service developes the best design in which to cast it. If it shouldn't be cast, Superior's service developes the reasons why.



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Diecasting:

Vacuum method reduces internal porosity.

Lower internal porosity in zinc diecastings is claimed with a new vacuum diecasting method and equipment recently put into production at the Detroit plant of Nelmor Corp.

The casting method evacuates and seals a standard diecasting die cavity before injection of molten metal. Fewer rejects, higher tensile strengths, and greater surface hardness are claimed through use of the method.

Reduced internal porosity of the diecastings plus the increase in skin hardness and thickness, and increase of tensile strength, is expected to enlarge the field for diecastings.

Scrap Problem

The need for improving the standard diecasting process has been demonstrated by the consistently higher scrap in diecasting departments as compared to the metal stamping, forming and other fabricating departments.

MORE DATA IF YOU WANT

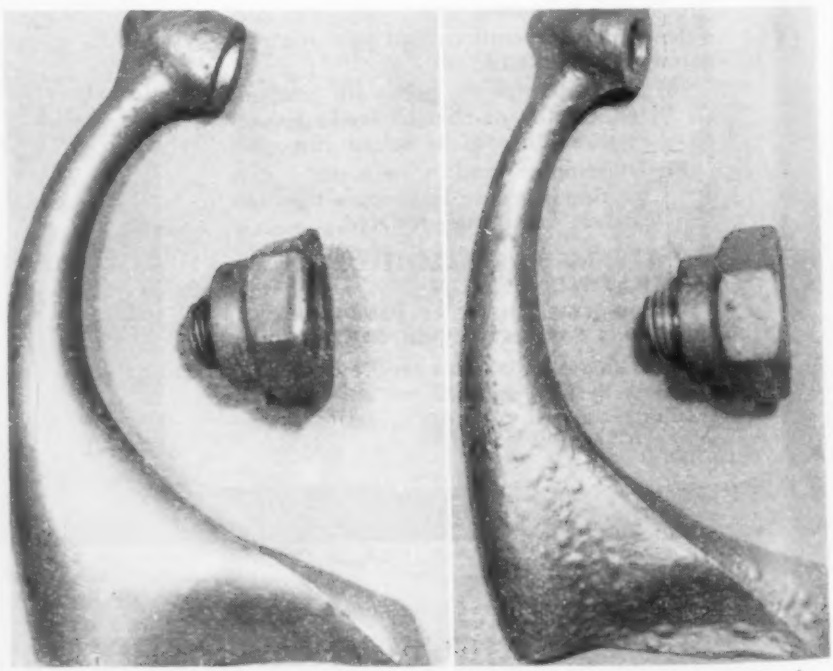
You may secure additional information on any item briefed in this section by using the reply card on page 109. Just indicate the page on which it appears. Be sure to note exactly the information wanted.

In addition to hot inspection scrap found immediately following the casting operation, rejections as a result of porosity frequently shown up in buffing and chrome plating operations.

High quality standards of the automotive industry, a large buyer of Nelmor's output of rear-vision mirrors, hand spotlights, and other similar polished and plated specialties, has required special emphasis on improved production methods.

Uses Standard Machine

The vacuum casting process employs a standard diecasting machine operating under special semi-automatic electric controls.



MORE ENTRAPPED AIR comes to surface of standard diecasting, right, than vacuum diecasting after being held at 750°F for 45 minutes.

and the process can be applied to any diecasting die normally mounted on the machine.

Some die adaptation is necessary for purposes of holding a vacuum, yet the die is easily returned to its former use with no impairment of its original function. The die may be used as either a standard die casting die or a vacuum die. Vacuum is maintained on the die cavities and controlled by means of additional valves and the vacuum source equipment.

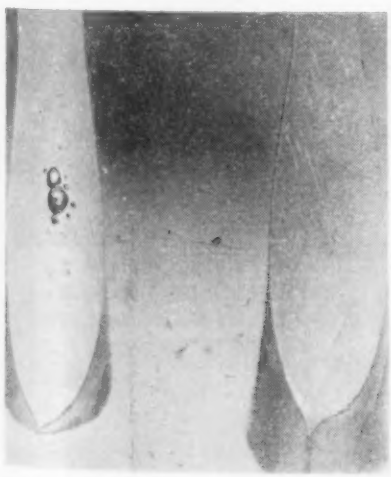
Processes Compared

To compare results of standard and vacuum casting two production parts were used. One of these, a rear-vision mirror frame casting, was selected because it had consistently been the most troublesome casting of its type. About 25 pct scrap occured in casting, buffing and plating. The other part, a back-up light switch housing, could not consistently be held to the minimum torque test requirements of 32 ft lb.

Skin Is Harder

The vacuum diecast nut showed an increase in torque tests to between 55 and 60 ft-lb and the mirror arm showed both increasing and deeper surface skin hardness.

This permitted heavier and deeper buffing without exposing porosity. To evaluate these re-



Porosity compared . . .

Turn to Page 160

Can You Check YES to these five questions?

- ☐ Do the gears you use have surface-hardened teeth?
- ☐ Are the cores tough, ductile, and shock-resistant?
- ☐ Do they always fit perfectly and require no run-in?
- ☐ Are they guaranteed to give maximum service life?
- ☐ Are you completely satisfied with them?

If not, you should use —

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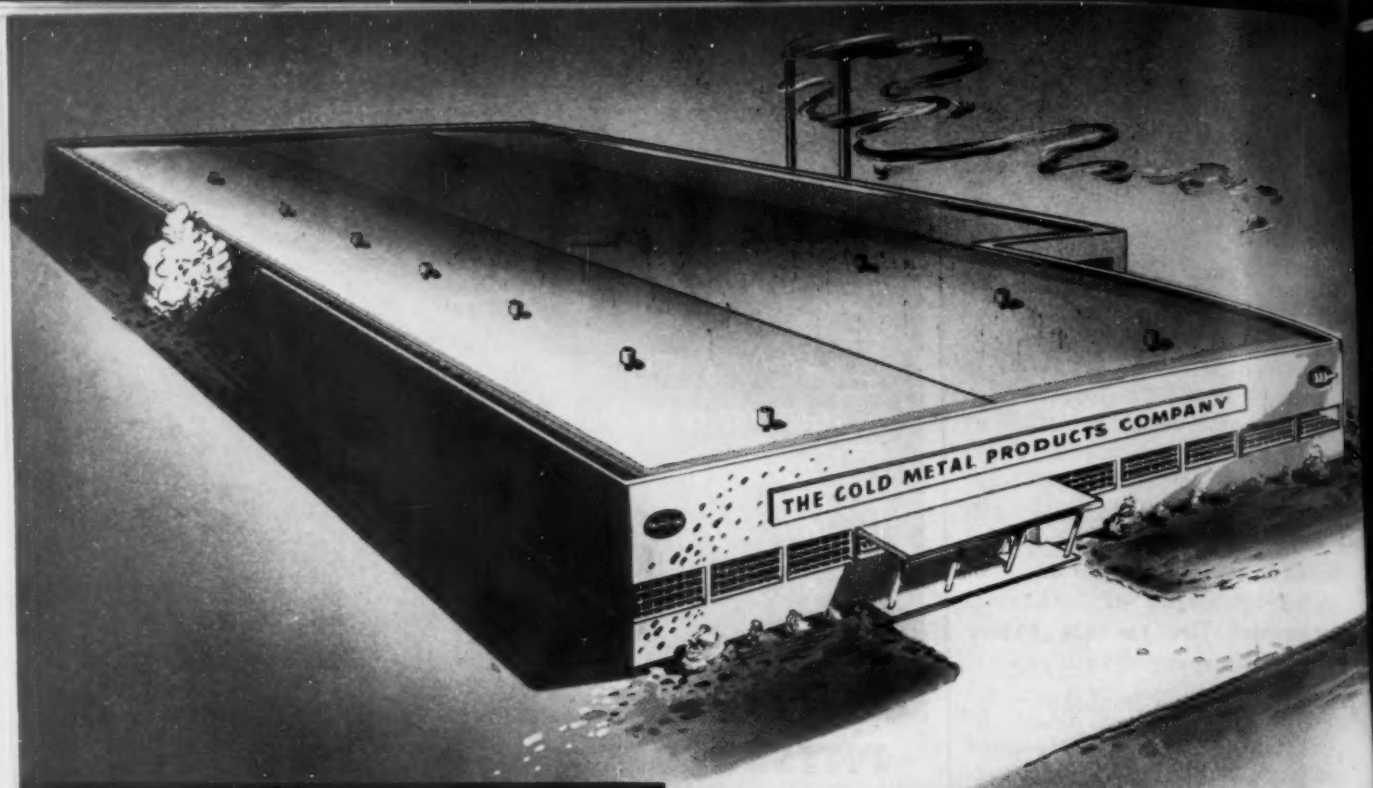


New CMP INDIANAPOLIS PLANT

This new additional plant of The Cold Metal Products Co. completes another step in the CMP expansion program. It's a special plant because it is technically engineered and equipped for the specialized production of the particular types of cold rolled strip and spring steel most needed by CMP customers in the mid-west area easily served from the Indianapolis location.

CONSTRUCTION

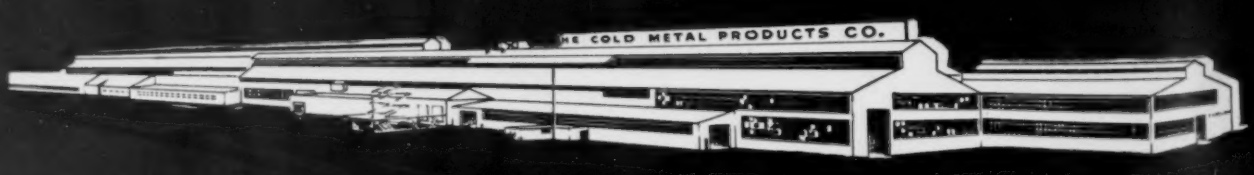
Constructed along lines of today's clean simplicity of structural design, it provides for the most efficient flow of material in process to net the lowest manufacturing cost practical for the special tolerances, structures and finishes characteristic of CMP strip and spring steel products.

FACILITIES

Included are CMP-Type designed and built 4-High cold rolling mills, annealing furnaces, slitters, pickle line and auxiliary equipment necessary to produce the high standard of quality generally identified with CMP strip and spring steel products.

LOCATION

On a 32 acre site at 2301 South Holt Road in suburban Indianapolis, CMP is the first company to recognize and provide for the steadily growing needs of the area as an important consumer of specialized flat rolled steel products.



YOUNGSTOWN PLANT AND GENERAL OFFICE

A COMPLETELY NEW PLANT . . .

FOR ADDITIONAL CMP PRECISION COLD ROLLED STRIP STEEL PRODUCTION

With the additional Indianapolis facilities now in operation and providing an increased tonnage of CMP strip all customers will benefit. Since more product will be produced more customers can be served and improved deliveries in all areas will result.

The fact that so many fabricators have turned to CMP for the cost saving and product improving advantages of "special spec" cold rolled strip and spring steel is forceful testimony to the importance of spending more time in checking the values CMP products can offer you.

THINSTEEL
TRADE MARK

C M P

How to make 150 containers disappear

Another example of packaging magic that couldn't be performed without Signode Steel Strapping!

The pallet load shown here contains 150 sub-assemblies, nested on returnable wooden trays, packaged for easy handling and shipping by strong bands of tensioned Signode Steel Strapping.

This method of packaging eliminated the use of 150 individual containers, and the materials needed to pack and seal them. Units were handled *once*—at the assembly line, where they were placed on the trays. Strapped to the pallet base, which also served as a tray, the trays became a single, pilfer-proof unit, easily handled by *one* man and a fork truck!

If you now ship by pallet or have products which can be shipped that way, and the economies apparent in this method of product packaging, handling and protection interest you, we will gladly supply detailed facts. Write Signode Steel Strapping Co., 2623 N. Western Ave., Chicago 47, Ill. Offices coast to coast. In Canada: Canadian Steel Strapping Co., Ltd. Foreign subsidiaries and distributors world-wide.

SIGNODE Steel Strapping Co.

SEND FOR FOLDER SHOWING 6 BASIC WAYS OF UNITIZING

sults further the parts were studied in the facilities of an independent commercial testing laboratory.

Difference Shown In X-rays

Differences between parts made by the two processes are further revealed by X-ray films showing relative density of the vacuum castings as compared to the evident porosity of standard castings.

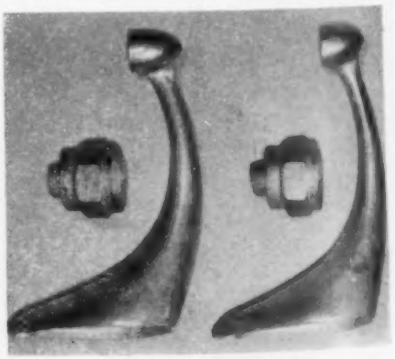
A comparison of weights of the same parts made by the two methods indicate a higher density of castings made under vacuum. Parts heated slowly to just below the melting point show expansion and escape of entrapped gases are greatly reduced in volume in vacuum cast parts. Tensile strength for comparable sections is also greater for vacuum cast parts.

Somewhat Longer Cycle

Vacuum diecasting requires a somewhat longer cycle than conventional diecasting. As a rule-of-thumb, any diecast part resulting in 10 pct or more of rejects can be economically cast using this process.

Diecasting types that might benefit from the process include quality chrome plated diecastings; castings that must be heated in their processing, as baking during enameling, or in use; castings where finish-machining exposes porosity; castings under definite strength requirements; gas and oil pressure-proof castings.

In general, vacuum casting will help where the part being cast has nonventable pockets, deep draws with insufficient casting pressure, or where cold shut is a problem.



Mirror nut and frame . . .

Turn to Page 163

Plastics:

Tail of Neptune bomber made at lower cost.

Stinger tails that house the weapons of the Navy's new Neptune patrol bomber are being fabricated from plastic with substantial savings at Zenith Plastics Co., Gardena, Calif.

The 17-foot tails are molded from reinforced plastics. The plastic piece combines advantages of savings in critically short engineering manpower, production manpower, and factory floor space.

Uses Simplified Design

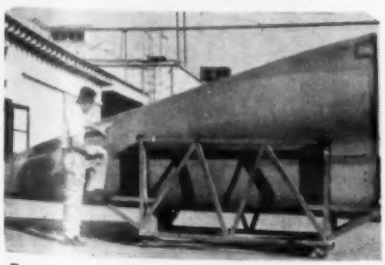
The new fuselage structure is molded of polyester resins developed by Bakelite Co., Division of Union Carbide and Carbon Corp. These resins are used to reinforce Fiberglas cloth molded as a honeycomb sandwich in a simplified monocoque design.

The Neptune's new tail is one of the first large fuselage structures molded of reinforced plastics manufactured on a mass production basis as an integral part of the aircraft design.

Many Savings Possible

Significant savings in time, labor, space and equipment are due to the unit's simplicity and flexibility of construction. Tool designs for five basic mold sections and two assembly fixtures were completed in

Subhunter's sting is . . .

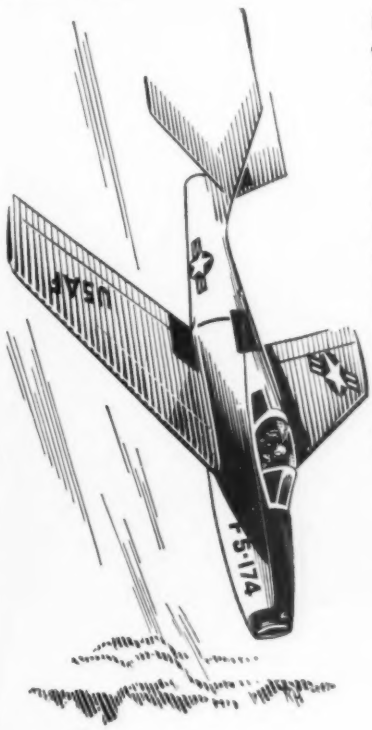


Protected by plastic . . .

Turn Page

THE REPUBLIC F-84F THUNDERSTREAK

A mainstay in the defense of the free world, this new fighter-bomber exceeds in all performance categories any previous Air Force fighter or fighter-bomber type.



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The catapult seat for this hot, new fighter-bomber had to combine light weight with rugged strength to resist shock and protect the pilot. Only the finest construction would do . . . there could be no compromise with dependability or quality. That's why Wallingford Steel Tubing was selected for the frame.

Like the Republic Aviation Corporation, many other satisfied tubing customers have learned that there's no source like Wallingford when it comes to meeting the most exacting specifications ***exactly*** and ***consistently***.

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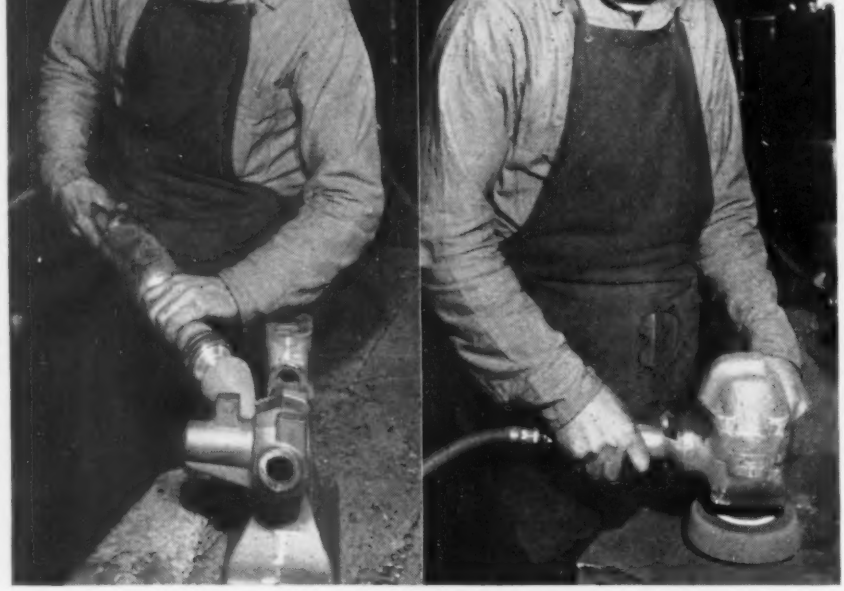
Or, better still, start looking for methods to improve product quality and reduce production costs. Like an Ohio foundry, where a test *proved* that a lighter, faster Buckeye portable grinder could do an even better job, in less time, at lower cost. And, as a "bonus," this grinder has been operating for more than two full years without any repair service required.

In every industry, it's time to improve your competitive position. If this involves portable air tools, it's time to test Buckeye Tools in your plant, on your work, to *prove* them to your own satisfaction. May we send you a copy of our Air Tools Catalog?

Getting into the corners is easy with this lightweight, maneuverable Buckeye horizontal grinder. Faster speed means less wear on cone wheels, too.

On jobs where large, relatively flat surfaces are worked, Buckeye vertical grinders help increase productive output, improve product quality.



Buckeye Tools CORPORATION
DIVISION 11 • DAYTON 1, OHIO

producers of the world's first successful rotary air tools

12 pct of the time estimated for a similar metal fuselage.

The tail is molded in five sections for easy disassembly in order to fit into a small space for aerial shipment. Economical metal sprayed molds with strong back-up shells of glass cloth impregnated with Bakelite polyester resins are used to produce these sections.

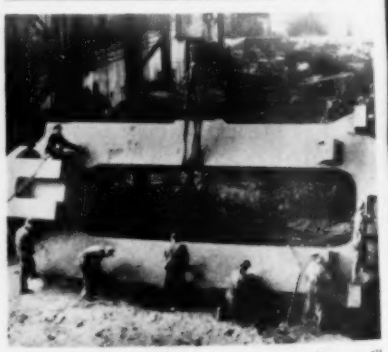
Metal Sprayed On Molds

Between ½ and 1 in. of metal is sprayed to form the mold consisting of zinc, bronze and aluminum layers. A single mold for each section thus replaces the large number of tools required for metal construction, such as press dies for frames and bulkheads, extrusion dies and rolls for stringers, forming dies for skins, drill jigs and rivet fixtures.

Molding Process Simple

The molding process itself is essentially simple. Several plies of glass cloth impregnated with polyester resins are built up to form the outer skin and transferred to the mold.

Pre-cut glass cloth honeycomb treated with resin is laid on this outer skin followed by another resin-impregnated laminate for the inner skin. Atmospheric pressure is applied with a vacuum line to draw off excess resins and gases. The mold is then rolled into a curing oven and a few hours later removed and cooled. Final assembly follows.



BIG STEEL CASTING, for rolling mill housing required 390 tons of steel at pouring. The mill, being built by Loewy-Hydropress, New York, will be used for heavy breakdown and plate rolling at the McCook, Ill., plant of Reynold's Metal Co. The mill is expected to be in operation during the latter part of 1954.

Metal Finishing:

Corrosion-resistant coating has advantages of stainless.

A corrosion-resistant alloy coating, developed recently by the New York Testing Laboratories, Inc., New York, imparts the advantages of stainless steel to ferrous material, it is claimed. The coating resists strong acids and acid gases and may have wide use in the oil refining and chemical fields. On ship plate, it reportedly increases resistance to salt water corrosion.

In the new process, phosphorus, when alloyed with metallic constituents in fairly large percentages of the total composition, reduces the melting point and increases fluidity of the alloy combination. The best constituent in this application is nickel.

Alloys At Interface

Nickel has a melting point of 2642° F, but when combined with phosphorus the melting point is near 1600°F allowing an easy application with moderate temperatures. This gives proper alloying and bonding to the base metal by using moderate temperatures.

Special means of application result in the formation of a ternary alloy at the interface of the coating with the base metal.

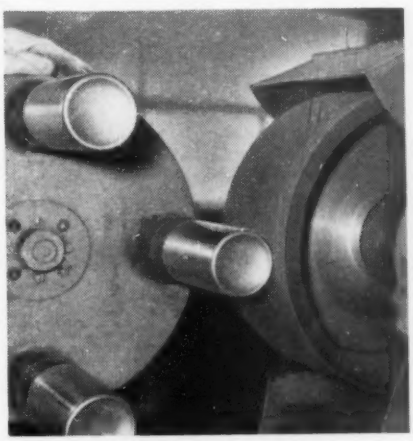
The basic materials for this process are nickel oxide and various phosphorus containing salts. After mixing to the desired consistency with water, they can be applied much like a paint. The basic constituents are easily obtainable and of relatively low cost.

The mechanism of producing the alloy in place is one of reduction under heat whereby metallic nickel and phosphorus are produced. These two basic constituents are alloyed and in turn bonded in place by forming a ternary alloy of iron-nickel and phosphorus at the interface of the coating and base metal.

Turn Page

How would you solve it?

(1) Production Problem: To cut unit costs of grinding and polishing stainless steel whip-cream dispenser cans. Nilsen Mfg. Co. had been jobbing out the cans to an outside source, paying a high .08¢ per can, due to old-fashioned methods, labor, material and delivery costs.



(2) Solution: A 3M Representative recommended that this Addison, Illinois, manufacturer install the 3M Method, using Grit #180 Resin Bond Belts running over a special contact wheel. Cans to be finished were placed on automatic work holders.

(3) Results: An immediate reduction in polishing costs. By installing the 3M Method, and doing the work themselves, Nilsen Mfg. Co. cut costs to only $.0125 per finished unit . . . a saving of $.0675 per can! A 3M Representative can help you solve your grinding and finishing problems, too. His services are available without cost.

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Molybdenum:

High purity metal prepared electrolytically by NBS.

Successful electrolytic preparation of molybdenum—a critical refractory metal for high-temperature applications—has been achieved by the National Bureau of Standards in a research program sponsored by the Army Ordnance Corps.

High-purity molybdenum was produced by electrolysis of a bath of fused salts. The process is flexible and easily controlled—depending on the conditions of electrolysis, deposits vary from fine powders to thick, coherent layers.

Lower-cost Methods Seen

With further development of the process, electroforming of molybdenum objects may become feasible. More rapid, less expensive methods for producing molybdenum parts and coatings and for extracting the metal from the ore may result from this work.

In recent years the need for heat-resistant materials in various applications has stimulated interest in refractory metals such as tungsten and molybdenum. At present molybdenum is produced chemically as a fine powder by reducing purified molybdic oxide with hydrogen. This process, however, is expensive and has some disadvantages. The molybdenum is obtained as a very fine powder, and the size of the particles cannot be controlled. Because of the fineness of the powder, a large surface area is exposed to oxidation and extensive purification is thus required. Complicated powder-metallurgy procedures are also necessary to fabricate the powder into molybdenum objects.

Obtained At Cathode

These disadvantages may be eliminated by the electrolytic method, as the deposits are obtained directly on the cathode in the desired physical form and in a very pure state. Applications of the method for electrowinning, electrorefining, electroforming, and electroplating are under study.

Electroforming would make possible the formation of molyb-

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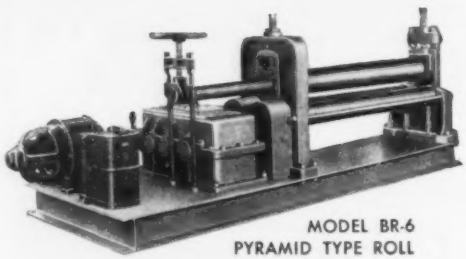
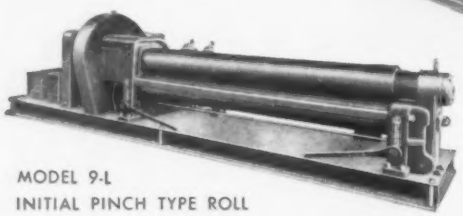
The Webb Corporation offers a complete line of Plate Bending Rolls for the rolling of the thinnest plate up to plate 2½" thick. Offered in a variety of lengths and thicknesses. Constructed for the modern fabricating shop.



MODEL BR-6
PYRAMID TYPE ROLL



MODEL 9-L
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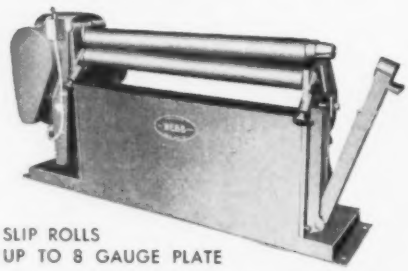

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denum parts having complicated shapes. Molybdenum electroplating would have the advantage of conserving this critical metal and at the same time allowing the designer to take advantage of the properties of the basic metal.

Other Metals Sought

The NBS work on molybdenum was part of a general program of research by the Bureau to develop methods for electrodepositing in good physical form metals—such as tungsten, titanium and zirconium—which have not been deposited from aqueous solutions.

Potassium hexachloromolybdate, (K_3MoCl_6), was selected for use in electrolytic preparation of molybdenum iron in molten mixtures of alkali halides.

Coarse powders of pure molybdenum were deposited on the cathode from a solution of K_3MoCl_6 in a 1.1 (by weight), mixture of sodium and potassium chlorides at 900°C and current densities of 3 to 100 amp/dm^2.

Product Varied

When a eutectic mixture of potassium and lithium chlorides was used at the same current densities and at temperatures between 600° and 900°C, the deposits varied in form. At 3 amp/dm^2 and 600°C the deposits were thick, coherent layers. At higher temperatures and current densities fine powders were produced. For both solutions the optimum concentration of the molybdenum salt was about 4 mole pct.

Contamination by oxy compounds resulted in low current efficiency and impure deposits. All materials were therefore dehydrated carefully before use, and the electrolyses were carried out in an argon atmosphere.

Apparatus was designed which permitted high-temperature operation with automatic temperature control, external manipulation of electrodes, and automatic agitation of the cathode.

Design of the equipment was simplified by use of induction heating. A water-cooled induction furnace coil surrounded the lower third of a Pyrex cylinder 1½ ft long and closed at the bottom.

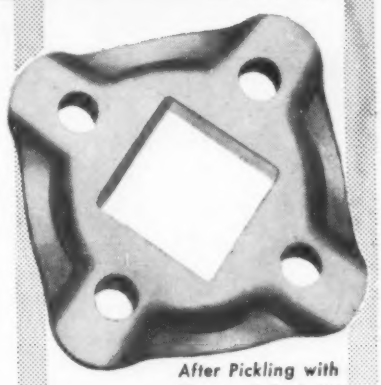
Inside the lower third of the Pyrex tube was placed a ceramic cylinder, and within the ceramic was a machined graphite crucible containing the fused salts. The top of the glass cylinder was sealed with a rubber bung containing openings for the electrodes, a thermocouple tube, a

Turn Page

To produce moly . . .

Acid for De-Scaling and Rust Removal ...of Course! BUT MAKE IT A *Safe* ACID!

Before Pickling



After Pickling with Magnus D-Scale-RS

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- Attacks only scale and rust.
- Does not "over-pickle."
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- Does a sure, dependable pickling job.
- Can be used hot or cold, in tumbling barrels, as well as in tanks.

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Write for Bulletin 36 for the whole story on fumeless high-speed de-scaling and de-rusting.

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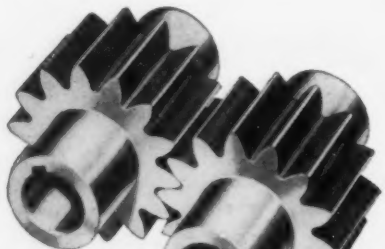

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TOOL COLUMBIA STEELS

connection to the gas system, and an escape chimney.

Stirring Motor Used

A rod ½ in. in diam and 2 ft long was inserted through one of the holes to serve as the cathode. It was connected at the top to a variable-speed stirring motor by a tightly fitted rubber coupling.

A soluble anode of pure commercial molybdenum sheet was used. If an insoluble anode is used a diaphragm is required to separate the anolyte from the catholyte. Both electrodes were immersed to a depth of about 3 in.

Power for the furnace was supplied by a mercury spark-gap converter, controlled by a chromel-alumel thermocouple and a controlling pyrometer placed in the input circuit of the converter. The heating rate was rapid, the melt reaching a temperature of 900°C in about 10 minutes.

Mixture First Purified

First the alkali chloride mixture was purified. This was done by fusing it in the graphite crucible at a temperature a few hundred degrees above its melting point and allowing it to cool in an inert atmosphere.

The glass vessel was then opened, and the previously dried molybdenum compound was quickly added on top of the solid halide solvent. The system was evacuated and flushed out with argon. Heating was begun, and at the desired operating temperature electrodes were inserted into the melt.

Argon Flow Varied

During the run the flow rate of the argon was set at any value between 200 and 3000 cm^3/min, and the outlet chimney was always adjusted to maintain a pressure slightly above atmospheric inside the system at all times.

When very hygroscopic material, such as lithium chloride, was present, the bath was heated to 900°C at the same time as the argon flow was increased to about 3000 cm^3/min. This rapidly drove out any released moisture and vol-

atile oxy compounds. Electrolytic purification was also found to be effective.

The deposits adhered well to the cathode and were easily separated from the adhering electrolyte by leaching with dilute hydrochloric acid. Deposits from both types of solutions were found to be more than 99.9 pct molybdenum and to contain as low as 0.026 pct oxygen.

Density of the deposits was 9.6, or 94 pct of the theoretical density of molybdenum. The current efficiency for metal deposition was 100 pct in both solutions over the full range of current density.

Machining:

New boring machine holds close concentricity.

Machining of jet turbine cylinders and boring operations on mud pump liners and other similar type parts have been simplified with a new type boring machine recently developed. Several of the machines have been built and are now in service. On test pieces, concentricity of 0.0005 in. has been maintained throughout.

Machining cycle of the center drive hydraulic boring machine, made by Wickes Bros., Div. of The Wickes Corp., Saginaw, Mich., can be entirely automatic.

Has Accurate Controls

When the gap bed comes to loading position, the spindle stops. The turbine shaft or cylinder is loaded and locked up on the chucks on both head and front ends. The operator then places the control for automatic operation and depresses the start button. The gap bed moves to the right controlled by limit switches and accurately located by a dial indicator.

The boring bar automatically goes through feed and rapid traverse until the extreme front end of the bar is piloted in the rear bushing. This supports the bar on both ends to eliminate vibration and any tendency to deflect.

Turn Page

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Industrialists concerned with Nationwide distribution of their products are finding Iowa a good move.
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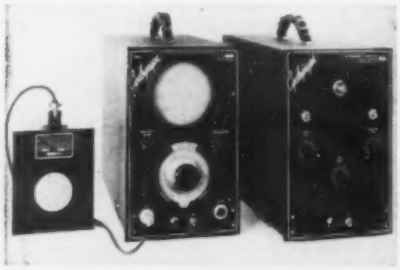

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—Technical Briefs—

In these cases, extra features designed into the new boring machine have proved their worth in meeting specific machining problems.

Boring Bar Reverses

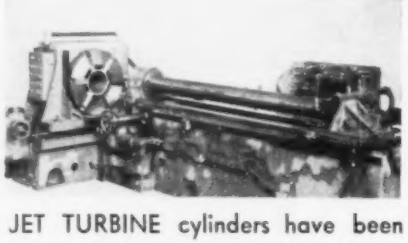
Tools can be set to cut predetermined depths and steps and the coolant is fed through the boring bar under pressure. Upon completion of the boring operation, the gap bed is moved to the left enough to relieve the tools from the cutting position.

The boring bar can be fed in, the gap bed again moved to a predetermined position to the right, and the boring bar reversed to perform chamfering and facing operations on the rear end of the work piece. When these operations are completed, the gap bed moves enough to clear all tools and the boring bar automatically goes into rapid traverse to its extreme position. The gap bed automatically moves out to its extreme left position. The spindle then comes to a full stop and the piece is ready to be unloaded.

Eliminates "Out of Round"

Six-jaw chucks have been used on both the head and tail ends to eliminate any tendency for "out of round." Test pieces were cut maintaining a concentricity of 0.0005 in. throughout.

First two Wickes Center Drive Hydraulic boring machines built were sent to the Lincoln-Mercury Aviation Plant at Romulus, Michigan. A third has been shipped to Mission Mfg. Co. of Houston, Texas for boring out mud pump liners in the oil field industry.



JET TURBINE cylinders have been machined more easily with this newly designed boring machine. Concentricities of 0.0005 in. have been maintained on test pieces. Many automatic features are included in the new machine.

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New Books:

Management and engineering problems discussed.

Aid for management and engineers in evaluating the complex problems with which they are faced daily is constantly at hand in the form of new books. Typical of these is a recent industry survey of wage payment problems.

"1954 Pay Almanac," by W. J. Casey, J. K. Lasser and Walter Lord. Management faces its biggest challenge to intelligent pay planning in the months ahead. Accent will be on normal peacetime output instead of defense production. Wage demands will probably continue high, and for the first time in 5 years, there will probably be more workers than jobs. To aid management planners in handling and establishing intelligent payment policies for executive, office and production groups, comprehensive comparative data on major wage and payment trends have been brought together in one volume. Business Reports, Inc., 1 Main St., Roslyn, N. Y. $12.50. 166 p.

"Welding Engineering," by Boniface E. Rossi. Presents an up-to-date and understandable account of welding science. Covers all phases of welding, soldering and brazing. Weldability of metals, design problems, metallurgy are discussed. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36. $8.00. 786 p.

"Formulas for Stress and Strain," by Raymond J. Roark. Third edition of a popular handbook for engineers working with machine and structural design problems. Formulas have been revised to bring them more in line with latest engineering data. New material has been added on sheer lag, stress and deflection of circular arches, flat plates with large deflection, pressure vessels and shells, and stress concentration. McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 36. $7.50. 381 p.

"World Population and Production, Trends and Outlook," by W. S. Woytinsky and E. S. Woytinsky. As mechanization gradually spreads to the corners of the world, its revolutionary impact on the lives of men and nations will be felt in every nation. Here is presented a worldwide survey of social and economic forces and trends, important deciding factors in world economic development. The book, with a volume now in progress on world trade, transportation and government to be published this year, presents a statistical picture of the collective resources of the world. The Twentieth Century Fund, 330 West 42nd St., New York 36, N. Y. $12.00 1268 p.

"Design In Structural Steel," by John E. Lothers. A comprehensive book on structural steel design written for architects, building contractors, structural, civil and consulting engineers. The book uses latest building and bridge specifications and demonstrates the most recent methods of analysis and design. Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N. Y. $10.00. 454 p.

"Major Problems of United States Foreign Policy, 1954." Seventh in the Brookings series of annual volumes, this surveys the world situation since the end of the war. Continuing objectives of the United States, Great Britain and Russia, as well as major problems in foreign policy of this country are discussed. The Brookings Institution, Washington 6, D. C. $2.00 (paper). 429 p.

"Temperature Measurement In Engineering," by H. D. Baker, E. A. Ryder, and N. H. Baker. A precise and well documented book, the first of two, discussing temperature in terms of engineering measurement. Presents all data needed to design, construct and operate an effective temperature measurement installation. Temperature measurement problems are classified and types of temperature measuring instruments listed. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $3.75. 179 p.

You are looking at a failure —BEFORE it happens!

The white line on the bolt pictured above is a Magnaflux* indication of a crack—a crack so small that it is invisible to the naked eye. This tiny crack would cause the breakage of the part and possible accident, wreckage and expense.

Most really serious cracks are too small to be seen even with microscopes or by penetrating rays. Other serious defects are also invisible, such as seams in metal bars, lack of bond in welds, porosity in castings, etc.

Many inspection methods have been developed by Magnaflux which make these defects visible. They test all metals, ceramics and plastics, and even concrete and clayware! They do not harm the part tested and can be used anywhere.

These inspection methods by Magnaflux treat each part quickly. They build up an easily seen "indication" right on the defect. These are usually lines of powder, or bright colored oils. The most widely used are fluorescent, to put a glowing line of light on the defect like that you see in the photo above. The cost: as low as ⅓¢ per part!

If cracked parts may be costly to you, write for specific information, or the free and interesting booklet, "Seeing Isn't Always Believing".

*T. M. Registered, U. S. Patent Office

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PENETROL saves PITTSBURGH STEEL CO. 1¼ mile steel trestle from destruction under excessive corrosive conditions!

AIR-DRYING OIL

1¼ miles of steel trestle . . . carrying endless strings of cars loaded with freshly-quenched granulated slag, that drip chemical and acid contaminated water on the structure continually . . . *yet it is safe and strong, in every joint and surface, because it's PENETROL protected!*

Here's what Jack Moreland, Supervisor of Painting, Pittsburgh Steel Co., Monessen, Pa., says: "This was a tough condition in 1941. We were becoming aware of the fact that thousands of joints and the large areas of flat surfaces in this trestle, were being subjected to rust and corrosion from many different sources. PENETROL was slushed into all joints and also applied to other pitted and rusted areas, during the time the surfaces were being cleaned for painting. The whole structure was given two coats of paint, each fortified with PENETROL. In 1947, the joints were okay . . . did not need special treatment . . . and we repainted the entire structure with paint to which we had added thn protective qualities of PENETROL. In 1954, the joints and general structure still are in good condition, thanks to PENETROL!"

Ever since this outstanding performance, the Pittsburgh Steel Company Monessen Mill has used the PENETROL system of protection on all it; steel structures. Here's the method:

(1) Brush, scrape and apply clear PENETROL to all joints and other rusted spots. *It is more important to PENETROL the joints than it is to paint any other part of the structure.*

(2) Apply prime and finish coats, fortified with PENETROL.

Use this time-proved, money-saving, structure-preserving PENETROL method to assure protection against rust to all inside, hidden, and exterior surfaces. Order PENETROL now!

PENETROL PRICES:
5 Gal. $15.75; 30 Gal. $88.50; 55 Gal. $159.50; F. O. B. Hudson, Ohio. Free Literature!

PENETROL© *is manufactured by*
THE FLOOD COMPANY
HUDSON, OHIO

Quick-As-Wink AIR AND HYDRAULIC Control Valves

FEATURE THIS MONTH

Single Plunger Solenoid Pilot Operated Valves

They'll give you millions of cycles of efficient trouble-free operation

● Quick-As-Wink Solenoid Valves are unsurpassed for positive, trouble-free dependable service . . . they give users millions of cycles of fast, high speed — and safe — operation. All parts are rugged. Low amperage requirement of the solenoid eliminates intermediate relays and simplifies electrical circuits. ⅜″ to 2″ sizes. 2-way, 3-way or 4-way actions. Bucking cylinder or double solenoid return. Send for the data sheets. Get full details about Quick-As-Wink, America's outstanding valve line, today.

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PUSH BUTTON OPERATED AIR VALVES

Push-pull or push and spring return operation — ⅛″ and ¼″ tapped connections. Widely used for controlling cylinders and many other applications. Air to 125 psi — vacuum—can also be used in low pressure hydraulic service.

LEVER OPERATED HYDRAULIC VALVES

Two position or three position valves ½″ to 1½″ sizes for line pressures 1000 to 5000 psi. Can be furnished in neutral, compound-exhaust or compound-on actions. Pilot cylinder operated types available up to 4″.

For Fully Descriptive Data Sheets Write

C. B. HUNT & SON, Inc.

Hand, Foot, Lever, Cam, Pilot, Diaphragm and Solenoid Control Valves

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The Iron Age
FOUNDED 1855
Markets and Prices

THE IRON AGE SUMMARY...

- Steel lucky scrap prices poor business barometer
- Prices down nearly $20 a ton since last summer
- Steel strike could halt industry by end of June

Steel producers can thank their lucky stars that scrap prices are not a reliable barometer of future steel business. For scrap prices are in the midst of a long sinking spell from which there is still no sign of recovery.

The scrap industry has been undergoing a severe and painful readjustment since the middle of last year. And the correction in supply and prices threatens the very life of some firms remote from consuming mills that had been supplying scrap during the emergency period.

Yet many steel companies are still doing pretty well while the steel industry averages about 75 pct operations.

Scrap prices started tumbling soon after THE IRON AGE Steel Scrap Composite Price hit its 1953 high of $44.92 per gross ton on July 28. Since then they have declined rather steadily—except for a month-long comeback in October and early November.

This week THE IRON AGE composite suffered it's sharpest drop in several weeks sinking another $1.34 a ton to $25.33 a gross ton. This marks the seventh consecutive week of decline, the twelfth in the past 13 weeks. Overall this price has fallen nearly $20 a ton since it hit its 1953 high last July.

Only once before since World War II have scrap prices suffered a shakeout comparable to the present one. That was in the first half of 1949 when prices fell more than half. This was followed by a steel inventory correction in the summer months. A month long strike during October of 1949 restored steel demand to its previous heights.

Will history repeat?

This is a question that doesn't find a ready answer. Most labor contracts in the steel industry expire June 30—provided the union gives 60 days notice of desire to negotiate a new one, and an agreement has not been reached by that time.

An easing steel market seems to have weakened the union's bargaining position, since mills no longer feel the desperate urgency that customers used to exert to keep steel production going at top speed. At the same time, the threat of unemployment has obviously intensified the union drive for security.

The security motive dominates the list of objectives that appear to be shaping up as United Steelworker strategy for 1954. These objectives include: (1) Higher pensions, (2) more social insurance, (3) guaranteed annual wage, and (4) a wage increase.

Relations between the United Steelworkers and the various steel companies have not suffered since David McDonald succeeded the late Philip Murray as head of the union.

But better relations do not necessarily mean that there won't be a strike. Steel companies will certainly be in a stronger position to resist union demands, now that they no longer feel the hot breath of customers on their necks. Also, there will likely be an increase in plant-wide vacations—both by steel companies and their customers.

Steelmaking operations this week are again scheduled at 74.0 pct of rated capacity.

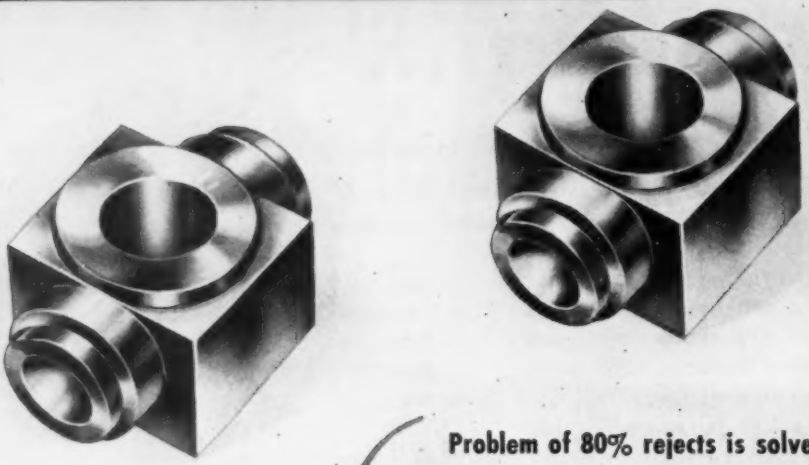
Steel Output, Operating Rates

	This Week†	Last Week	Month Ago	Year Ago
Net Tons Produced (000 omitted)	**1,772**	**1,774**	**1,766**	**2,235**
Ingot Production Index (1947—49 = 100)	**110.3**	**110.4**	**109.9**	**139.1**
District Operating Rates				
Chicago	82.5	83.0	81.0	102.0
Pittsburgh	89.0	90.0*	86.0	106.0
Philadelphia	76.0	76.0	78.0	97.0
Valley	72.0	70.0*	71.0	101.0
West	81.5	79.0*	78.0	107.5
Detroit	73.0	70.0*	85.0	103.0
Buffalo	75.0	84.0	63.5	94.0
Cleveland	73.5	75.5*	82.5	99.0
Birmingham	80.0	76.5	87.0	98.5
S. Ohio River	73.5	73.5	78.0	90.0
Wheeling	79.0	81.0*	81.0	102.0
St. Louis	35.5	35.5	65.0	93.5
East	69.5	31.0	61.0	97.0
Aggregate	**74.0**	**74.0**	**74.5**	**100.5**

Per cent of capacity for weeks in 1954 is based on annual capacity of 124,330,410 net tons as of Jan. 1, 1954. Per cent of capacity for last year is based on annual capacity of 117,547,470 tons as of Jan. 1, 1953.

* Revised.
† Tentative.

2 Stainless Parts... *look alike*



but with 1 of them

Problem of 80% rejects is solved

This is a precision part for a military bombsight. Some of the tolerances are ±.0001″. Dependability is a "must". Every factor has to be "on the nose". Yet when the subcontractor used several ordinary Type 416 Stainless steels, rejects ran as high as 80%. But then he made one change . . . to Carpenter No. 5 (Type 416) . . . and eliminated the problem.

Tool life increases

Also, tool life was short, machine downtime excessive, and production was lagging. Then one change was made—to Carpenter Stainless No. 5—and machining time was shortened, tool life raised to a trouble-free level.

Production jumps

With Carpenter No. 5 production of this part is up to schedule because the reject problem has disappeared, machining time stepped up and tool life increased. Here is just one more example of how *Carpenter quality* makes a real difference in stainless fabrication. The next time you order stainless, be sure it's Carpenter. Watch it speed production—ease headaches from first operation to the last.

Make the <u>one</u> change that counts . . .

change to *Carpenter* STEEL

Free-Machining Stainless

take the problems out of production

THE CARPENTER STEEL COMPANY, 121 W. Bern St., Reading, Pa.
Export Department: The Carpenter Steel Co., Port Washington, N.Y.—"CARSTEELCO"

For fast delivery, call your nearest Carpenter Mill-Branch Warehouse, Office or Distributor

Markets at a Glance

Weirton To Expand Facilities . . . The $85 million, 5-year expansion program for Weirton Steel Co. Div., Weirton, W. Va., announced last April by Chairman Ernest T. Weir of National Steel, is slated to get under way this year. A $77.3 million Certificate of Necessity with a 25 pct accelerated tax amortization allowance has been issued by the Office of Defense Mobilization. The expansion program, expected to raise Weirton's tinplate capacity from 22 to approximately 30 million base boxes, includes enlarging of galvanizing and zinc coating facilities and rebuilding of the 4-high 54-in. continuous hot mill into a 66-in. mill.

Set January Record . . . Ford Motor Co. broke all January sales records of its 50-year history last month, with Ford and Lincoln-Mercury dealers selling more passenger cars and trucks than in any other January since the first Ford car was built. Both major divisions of the company established sales records for the month. Ford accounted for 112,593 units and Lincoln-Mercury 28,040 cars.

New House Marketing Plan . . . U. S. Steel Homes, Inc., last week established a new program to provide financial assistance to qualified franchise dealers. The program will be undertaken by U. S. Steel Homes Credit Corp., a new subsidiary. The unit will provide construction financing and assistance in marketing mortgages on erected houses.

Southern Rate Rises . . . Steel ingot production in the South, which dipped to 76.3 pct of rated capacity last week, will be back at 80 pct this week.

More Per Head . . . A new record in per capita production of steel was set by the steel industry of the United States last year. American Iron and Steel Institute reports a total of 1398 lb of steel produced for each person during the past year.

Bogus Steel Salesman Caught . . . The FBI has notified THE IRON AGE of the recent arrest in New York of Albert Fred Romanuik, a so-called steel salesman from Detroit who had been operating in the East and Middle West. Romanuik, 32, who is alleged to have obtained his steel by fraud and sold it for a profit, is being held in $5000 bail. See THE IRON AGE, Jan. 28, p. 66.

Cut Plate Prices . . . Three premium-price eastern steel producers last week cut prices on carbon steel plate to prevailing mill levels. Putting through the price revisions were Alan Wood Steel Co., Claymont Steel Corp., and Lukens Steel Co. New price listed by these companies is $4.10 per 100 lb.

Ease Copper Controls . . . Amendment of order M-11A this week further reduces the percentages of copper and copper base alloy products which must be reserved during the second quarter to meet defense and atomic energy rated orders. Percentage of copper wire mill products for which mill space is to be reserved for second quarter delivery is reduced from 20 pct to 16 pct. For copper foundry products and unalloyed copper powder mill products, the reduction is from 27 to 15 pct. Reductions do not apply to military ammunition disks nor to copper base alloy powder mill products. Reserve space for these will be controlled by directive.

Freight Car Deliveries Off . . . January delivery of new domestic freight cars was 3000 less than in the same period of 1953. The American Railway Car Institute and the Association of American Railroads report 4944 cars delivered last month. Orders for 2933 new cars were placed during the month leaving an order backlog of 27,959 as of February 1. That figure represents a decline of 2000 units from last year's backlog on the same date.

Prices At A Glance

(cents per lb unless otherwise noted)

	This Week	Week Ago	Month Ago	Year Ago
Composite prices				
Finished Steel, base	4.634	4.634	4.634	4.376
Pig Iron (gross ton)	$56.59	$56.59	$56.59	$55.26
Scrap, No. 1 hvy. (gross ton)	$25.33	$26.67	$28.50	$43.67
Nonferrous				
Aluminum, ingot	21.50	21.50	21.50	20.50
Copper, electrolytic	29.75	29.75	29.75	24.50
Lead, St. Louis	12.80	12.80	12.80	13.30
Magnesium, ingot	27.75	27.75	27.75	24.50
Nickel, electrolytic	63.08	63.08	63.08	63.08
Tin, Straits, N. Y.	85.00	85.00	84.50	$1.21½
Zinc, E. St. Louis	9.25	9.50	9.50	11.50

January Copper Deliveries Plummet

U. S. fabricators got only 77,091 tons of refined copper in January, off 35,000 tons . . . This month will be higher, but output will dip—By *R. L. Hatschek.*

Deliveries of refined copper to U. S. fabricators in January totaled only 77,091 tons. This compares with 112,244 tons in December, a 1953 monthly average of 120,310, and is the lowest monthly total since July, 1949, acording to the latest Copper Institute report.

Refined copper stocks, as a result, hurdled the 100,000-ton mark and stood at 108,121 tons as of Feb. 1, an increase of 20,409 tons to the highest point since December, 1949.

Output Dips . . . Primary domestic production in January held about on an even keel with a total of 77,155 tons as against 78,500 tons for December. Refined output, however, declined nearly 12,000 tons to 111,553 tons. Expectation for February is that reduction of overtime by major mining companies will trim the primary output more significantly.

Reduction in deliveries was pretty much expected by those who kept tabs on daily sales totals during the month. For the current month, these daily figures are running about 10,000 tons ahead of January business. Those in the trade anticipate a February total of about 85,000 to 90,000 tons if sales maintain their pace.

Foreign Down, Too . . . January statistics for producers outside the U. S. show lower production but higher deliveries and a stock decrease of only 20 tons. Primary production was 113,524 tons, off about 5200 tons. Refined output dropped about 13,000 tons to a total of 85,436 tons. And deliveries to fabricators were boosted by 5300 tons to 92,277 tons. Refined stocks at the end of the month were steady at 280,510 tons.

Stabilize Prices . . . A new move is underway within Congress to create a new federal agency for the purpose of stabilizing the supply and market for domestic tungsten, lead and zinc.

Under provisions of legislation introduced by Sen. Edwin C. Johnson, D., Colo., a Metals Credit Corp. would be established for this purpose.

The agency would be authorized to use up to $6.7 billion for purchase, storage and maintenance of stocks. No purchase could be made at less than the going domestic price.

Stocks could be sold to industry whenever needed but not at bargain counter prices. Price would have to be equal to or more than the government paid for its stocks.

See Early Tariff Decision . . . The Tariff Commission has until June to make its recommendations on proposed boost in import duties on lead and zinc. But speedier action appears to be forthcoming.

The mining industry last fall petitioned the commission for relief under the escape clause in the Trade Agreements Act. And the commission is reported to have made a thorough study of the employment situation in the industry since 1952. A recent resolution was passed to the effect that the report be ready by Mar. 31.

Under the terms of the escape clause, tariffs can be boosted to 1.8¢ per lb of lead or zinc contained in ores and concentrates, 2.5¢ per lb of metallic lead and 2.1¢ per lb of metallic zinc.

Check Nickel Market . . . Protests by electroplaters over trimmed nickel allotments have pushed the House Committee on Small Business into a study of the "Actual supply situation." Stepped up stockpiling and military use (See THE IRON AGE, Feb. 11, p. 67) are costing electroplaters so dearly that at least one says, "If we take another cut in March like we got in January I might as well pack up and take a vacation."

Recent government actions to further increase the total supply include a green light for a 75 pct expansion of facilities at the government plant in Nicaro, Cuba and a healthy Certificate of Necessity for Freeport Sulphur Co.

Allot $43 Million . . . Office of Defense Mobilization has ordered the expansion at Nicaro and allocated $43 million for the job. Current capacity is about 29.5 million lb per year and the increase will push this up to more than 50 million lb.

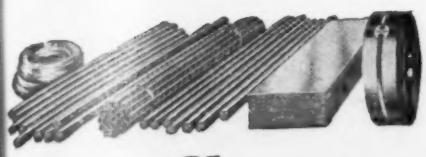
Freeport received a certificate for rapid amortization of 80 pct of $55,250,000 for facilities at Moa Bay, Cuba, and near New Orleans. Object is nickel and cobalt.

NONFERROUS METAL PRICES

(Cents per lb except as noted)

	Feb. 10	Feb. 11	Feb. 12	Feb. 13	Feb. 15	Feb. 16
Copper, electro, Conn.	29.50–30.00	29.50–30.00	....	29.50–30.00	29.50–30.00	29.50–30.00
Copper, Lake delivered	30.00	30.00	....	30.00	30.00	30.00
Tin, Straits, New York	84.50	84.50	....	....	85.00	85.00*
Zinc, East St. Louis	9.50	9.50	....	9.50	9.25	9.25
Lead, St. Louis	12.80	12.80	....	12.80	12.80	12.80

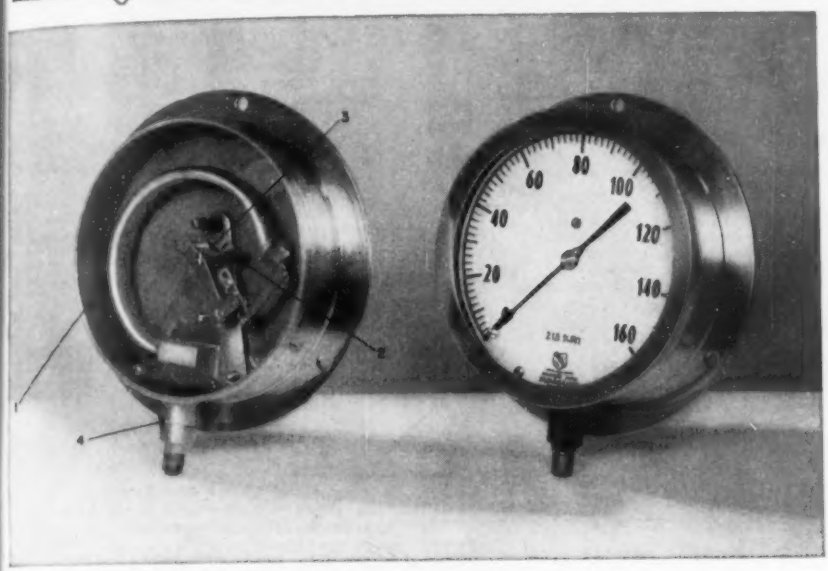
Note: Quotations are going prices
*Tentative



BRIDGEPORT BRASS COMPANY

COPPER ALLOY BULLETIN

Bridgeport BRASS CO. MILLS IN BRIDGEPORT, CONN. AND INDIANAPOLIS, IND.—IN CANADA: NORANDA COPPER AND BRASS LIMITED, MONTREAL



Interior of Ashcroft Duragauge at left shows where copper-base alloys are widely used because of their dependability and corrosion resistance. Brass and Bronze are especially important at the following key points: (1) Bourdon Tube, (2) Gear Segment, (3) Rotary Geared Movement, (4) Socket. Courtesy of Manning, Maxwell & Moore, Inc., Stratford, Conn.

Quality Gauges Rely on Copper Alloys

How many of us realize the importance of dependable gauges which are so vital to modern living. Wherever there's a need for accurate measurement, you'll find gauges. In fact, there are applications beyond number where gauges automatically safeguard lives, equipment, and uniformity of product.

Just as gauges are essential to the making of many things, copper-base alloys are vital to the accuracy and dependable performance of their sensitive yet rugged components.

Quality gauges designed for air, water, steam, oil and other media use high corrosion-resistant copper alloys because accurate readings are imperative in spite of constant surges, fluctuations, pulsations, vibrations, and corrosive attack encountered in service.

In the pressure gauge illustrated, one of the most important parts is the curved Bourdon tube whose elliptical shape and the accuracy of the tube-wall curvature, as well as the physical properties of the metal, are all very critical.

As pressure is applied inside the Bourdon tube, it tends to straighten out, resulting in deflection of the free end of the tube. This end of the Bourdon tube is linked to the gear segment in mesh with the pinion gear that moves the pivot shaft to which the pointer is attached. The amount of motion is transmitted to the pointer which moves over a calibrated scale and indicates the applied pressure.

The temper and spring characteristics of the metal in the Bourdon tube prevent it from becoming "set" after repeated flexing. Any change in its physical characteristics or corrosive attack would affect the accuracy of the gauge. Consequently, copper-base alloys are widely used in gauge construction, which comprises the rotary geared movement that is actuated by the Bourdon tube, the socket, plates, segment, columns, pivot shafts, pinion gear, hair spring, bushings, link and link screws, and closing end for the tube and the case.

Phosphor Bronze Widely Used in Rotary Geared Movement

Phosphor Bronze, Grade A, long known for its excellent spring properties, its fine resistance toward fatigue and corrosion is generally used for Bourdon tubing for pressure gauges designed for medium and low pressures and vacuum measurements. This alloy contains about 95% copper, and 5% tin.

In some instances, Alloy 21, which contains approximately 81% copper, 1.1% tin and balance zinc, is used for making Bourdon tubing for low pressure steam gauges.

Phosphor Bronze, Grade A, is also used for the hair spring, which takes the back lash out of the rack and pinion assembly.

The gear segment bushing and link screws are also made from Phosphor Bronze on the higher quality instruments, although leaded brass is very often used for these applications.

Leaded Brass for Ease of Machining

The plates, blanked, pierced, drilled, reamed and tapped, are made of clock brass for clean, sharp blanking and free machinability. This contains about 62% copper, 2% lead, and balance zinc. The socket, into which the Bourdon tube is mounted and on which the movement is attached, whose end is threaded for pipe connection, is square free-machining brass rod, Alloy 6—copper about 61%, lead 3.4%, zinc remainder. Drilling, turning, milling, threading and tapping are done at great speeds on this high-leaded alloy.

Laboratory Service Available

The selection of the correct material for all types of products can be simplified by contacting our nearest district office for information. Machining, corrosion and other problems are discussed in our "Technical Handbook," a copy of which will be sent to you on your request. Be sure to write for your copy on your company stationery.

(1290)

Nonferrous Prices

(Effective Feb. 16, 1954)

MILL PRODUCTS

(Cents per lb, unless otherwise noted)

Aluminum

(Base 30,000 lb, f.o.b. ship. pt. frt. allowed)

Flat Sheet: 0.136 in. and thicker, 2S, 3S, 33.9¢; 4S, 36.0¢; 52S, 38.2¢; 24S-O, 24S-OAL, 37.0¢; 75S-O, 75S-OAL, 44.7¢; 0.081-in., 2S, 3S, 35.1¢; 4S, 37.7¢; 52S, 39.9¢; 24S-O, 24S-OAL, 38.4¢; 75S-O, 75S-OAL, 46.9¢. 0.032-in., 2S, 3S, 37.0¢; 4S, 41.8¢; 24S-O, 24S-OAL, 46.9¢; 75S-O, 75S-OAL, 58.4¢.

Plate, ¼-in. and Heavier: 2S-F, 3S-F, 32.4¢; 4S-F, 34.5¢; 52S-F, 36.2¢; 61S-O, 35.6¢; 24S-O, 24S-OAL, 36.9¢; 75S-O, 75S-OAL, 44.3¢.

Extruded Solid Shapes: Shape factors 1 to 5, 36.5¢ to 82.8¢; 12 to 14, 37.2¢ to 99.0¢; 24 to 26, 39.9¢ to $1.29; 36 to 38, 47.2¢ to $1.89.

Rod, Rolled: 1.064 to 4.5-in., 2S-F, 3S-F, 43.8¢ to 37.2¢; cold-finished, 0.375 to 3.499-in., 2S-F, 3S-F, 47.6¢ to 39.3¢.

Screw Machine Stock: Rounds, 11S-T3, ⅛ to 11/32-in., 59.6¢ to 47.0¢; ⅜ to 1½-in., 46.6¢ to 43.8¢; 1 9/16 to 3-in., 42.7¢ to 39.9¢. Base 5000 lb.

Drawn Wire: Coiled 0.051 to 0.374-in., 2S, 44.1¢ to 32.4¢; 52S, 53.4¢ to 39.1¢; 17S-T4, 60.1¢ to 41.8¢; 61S-T4, 53.9¢ to 41.3¢.

Extruded Tubing: Rounds, 63S-T5, OD 1¼ to 2-in., 31.6¢ to 60.7¢; 2 to 4 in., 37.7¢ to 51.1¢; 4 to 6 in., 38.2¢ to 46.6¢; 6 to 9 in., 38.7¢ to 48.8¢.

Roofing Sheet: Flat, per sheet, 0.032-in., 42¾ x 60 in., $2.838; x 96 in., $4.543; x 120 in., $5.680; x 144 in., $6.816. Coiled sheet, per lb, 0.019 in. x 28 in.

Magnesium

(F.o.b. mill, freight allowed)

Sheet and plate: FS1-O¼ in., 66¢; 3/16 in., 68¢; ½ in., 70¢; B & S Gage 10, 71¢; 12, 75¢. Specifications grade higher. Base: 30,000 lb.

Extruded Round Rod: M, diam ¼ to 0.311 in., 77¢; ½ to ⅝ in., 60.5¢; 1¼ to 1.749 in., 66¢; 2½ to 5 in., 51.5¢. Other alloys higher. Base up to ⅝ in. diam, 10,000 lb; ¾ to 2 in., 20,000 lb; 2 in. and larger, 30,000 lb.

Extruded Solid Shapes: Rectangles: M. In weight per ft, for perimeters less than size indicated; 0.10 to 0.11 lb, 3.5 in., 65.3¢; 0.22 to 0.25 lb, 5.9 in., 62.3¢; 0.50 to 0.59 lb, 8.6 in., 59.7¢; 1.8 to 2.59 lb, 19.5 in., 56.8¢; 4 to 6 lb, 28 in., 52¢. Other alloys higher. Base, in weight per ft of shape: Up to ½ lb, 10,000 lb; ½ to 1.80 lb, 20,000 lb; 1.80 lb and heavier, 30,000 lb.

Extruded Round Tubing: M, 0.049 to 0.057 in. wall thickness: OD, ¼ to 5/16 in., $1.43; 5/16 to ⅜ in., $1.29; ½ to ⅝ in., 96¢; 1 to 2 in., 79¢; 0.165 to 0.219 in. wall; OD, ⅝ to ¾ in., 64¢; 1 to 2 in., 60¢; 3 to 4 in., 59¢. Other alloys higher. Base, OD: Up to 1½ in., 10,000 lb; 1½ to 3 in., 20,000 lb; over 3 in., 30,000 lb.

Titanium

(10,000 lb base, f.o.b. mill)

Commercially pure and alloy grades; Sheets and strip, HR or CR, $15; Plate, HR, $12; Wire, rolled and/or drawn, $10; Bar, HR or forged, $6; Forgings, $6.

Nickel, Monel, Inconel

(Base prices, f.o.b. mill)

	"A" Nickel	Monel	Inconel
Sheet, CR	86½	67½	92½
Strip, CR	92½	70½	98½
Rod, bar	82½	65½	88½
Angles, HR	82½	65½	88½
Plate, HR	84½	66½	90½
Seamless Tube	115½	100½	137½
Shot, blocks	....	60	....

Copper, Brass, Bronze

(Freight included on 500 lb)

	Sheet	Rods	Extruded Shapes
Copper	46.41	....	48.48
Copper, h-r	48.38	44.73	....
Copper, drawn	....	45.98	....
Low brass	44.47	44.41	....
Yellow brass	4.172	41.66	....
Red brass	45.44	45.38	....
Naval brass	45.76	40.07	41.33
Leaded brass	....	....	39.11
Com. bronze	46.95	46.89	....
Mang. bronze	49.48	43.62	45.18
Phos. bronze	66.58	67.08	....
Muntz metal	43.96	39.77	41.02
Ni silver, 10 pct	55.36	....	62.63

PRIMARY METALS

(Cents per lb, unless otherwise noted)

Aluminum ingot, 99+%, 10,000 lb, freight allowed	21.50
Aluminum pig	20.00
Antimony, American, Laredo, Tex.	28.50
Beryllium copper, per lb conta'd Be.	$40.00
Beryllium aluminum 5% Be, Dollars per lb contained Be	$72.75
Bismuth, ton lots	$2.25
Cadmium, del'd	$1.70
Cobalt, 97-99% (per lb)	$2.60 to $2.67
Copper, electro, Conn. Valley	29.50 to 30.00
Copper, Lake, delivered	30.00
Gold, U. S. Treas., dollars per oz.	$35.00
Indium, 99.8%, dollars per troy oz.	$2.25
Iridium, dollars per troy oz.	$165 to $175
Lead, St. Louis	12.80
Lead, New York	13.00
Magnesium, 99.8+%, f.o.b. Freeport, Tex., 10,000 lb, pig	27.00
Ingot	27.75
Magnesium, sticks, 100 to 500 lb.	46.00 to 48.00
Mercury, dollars per 76-lb flask, f.o.b. New York	$188 to $191
Nickel electro, f.o.b. N. Y. warehouse	63.08
Nickel oxide sinter, at Copper Creek, Ont., contained nickel	56.25
Palladium, dollars per troy oz.	$22 to $24
Platinum, dollars per troy oz.	$90 to $92
Silver, New York, cents per oz	85.25
Tin, New York	85.00
Titanium, sponge	$5.00
Zinc, East St. Louis	9.25
Zinc, New York	9.75
Zirconium copper, 50 pct	$6.20

REMELTED METALS

Brass Ingot

(Cents per lb delivered carloads)

85-5-5-5 ingot	
No. 115	23.50
No. 120	22.75
No. 123	22.25
80-10-10 ingot	
No. 305	27.75
No. 315	25.50
88-10-2 ingot	
No. 210	36.50
No. 215	33.00
No. 245	28.50
Yellow ingot	
No. 405	19.75
Manganese bronze	
No. 421	24.25

Aluminum Ingot

(Cents per lb del'd 30,000 lb and over)

95-5 aluminum-silicon alloys	
0.30 copper, max.	22.00-22.25
0.60 copper, max.	21.75-22.00
Piston alloys (No. 122 type)	18.75-19.50
No. 12 alum. (No. 2 grade)	18.25-19.00
108 alloy	19.00-19.50
195 alloy	20.50-21.00
13 alloy (0.60 copper max.)	21.75-22.00
ASX-679	19.00-19.50

Steel deoxidizing aluminum, notch-bar granulated or shot

Grade 1—96-97½%	19.50-20.00
Grade 2—92-95%	18.00-19.00
Grade 3—90-92%	17.00-17.50
Grade 4—85-90%	15.50-16.50

ELECTROPLATING SUPPLIES

Anodes

(Cents per lb, freight allowed, 5000 lb lots)

Copper	
Cast, oval, 15 in. or longer	44.54
Electrodeposited	38.38
Flat rolled	47.14
Brass, 80-20	
Cast, oval, 15 in. or longer	43.515
Zinc, flat cast	20.25
Ball, anodes	18.50
Nickel, 99 pct plus	
Cast	84.00
Cadmium	$1.75
Silver 999 fine, rolled, 100 oz. lots, per troy oz, f.o.b. Bridgeport, Conn.	94⅛

Chemicals

(Cents per lb, f.o.b. shipping points)

Copper cyanide, 100 lb drum	63.90
Copper sulfate, 99.5 crystals, bbl.	12.85
Nickel salts, single or double, 4-100 lb bags, frt. allowed	30.00
Nickel chloride, 375 lb drum	38.00
Silver cyanide, 100 oz. lots, per oz.	75½
Sodium cyanide, 96 pct domestic 200 lb drums	19.25
Zinc cyanide, 100 lb drum	54.30

SCRAP METALS

Brass Mill Scrap

(Cents per pound, add 1¢ per lb for shipments of 20,000 lb and over)

	Heavy	Turnings
Copper	26	25¼
Yellow brass	19¾	18
Red brass	23	22¼
Comm. bronze	23⅞	23⅛
Mang. bronze	18¼	17½
Yellow brass rod ends	19½	....

Custom Smelters' Scrap

(Cents per pound carload lots, delivered to refinery)

No. 1 copper wire	24
No. 2 copper wire	22½
Light copper	21
*Refinery brass	20

*Dry copper content.

Ingot Makers' Scrap

(Cents per pound carload lots, delivered to refinery)

No. 1 copper wire	24 —24½
No. 2 copper wire	22½—23
Light copper	21 —21½
No. 1 composition	17½—18
No. 1 comp. turnings	17
Rolled brass	14½—15½
Brass pipe	15 —16
Radiators	13½
Aluminum	
Mixed old cast	10½—11
Mixed new clips	12 —12½
Mixed turnings, dry	10½—11½
Pots and pans	10½—11

Dealers' Scrap

(Dealers' buying price, f.o.b. New York in cents per pound)

Copper and Brass	
No. 1 heavy copper and wire	22½—23
No. 2 heavy copper and wire	20½—21
Light copper	18½—19
New type shell cuttings	18 —18½
Auto radiators (unsweated)	11½—12
No. 1 composition	15½—16
No. 1 composition turnings	15 —15½
Unlined red car boxes	13 —13½
Cocks and faucets	13 —13½
Mixed heavy yellow brass	10 —10½
Old rolled brass	12½—13
Brass pipe	14½—15
New soft brass clippings	15½—16
Brass rod ends	12½—13
No. 1 brass rod turnings	10½—11
Aluminum	
Alum. pistons and struts	5 — 6
Aluminum crankcases	8 — 9
2S aluminum clippings	11 —11½
Old sheet and utensils	8 — 9
Borings and turnings	5 — 6
Misc. cast aluminum	8 — 9
Dural clips (24S)	9 —10
Zinc	
New zinc clippings	4½— 5
Old zinc	3½— 3½
Zinc routings	1⅞— 2¼
Old die cast scrap	2¼— 3
Nickel and Monel	
Pure nickel clippings	60 —65
Clean nickel turnings	40
Nickel anodes	60 —65
Nickel rod ends	60 —65
New Monel clippings	22 —24
Clean Monel turnings	14 —15
Old sheet Monel	20 —22
Nickel silver clippings, mixed	13
Nickel silver turnings, mixed	11
Lead	
Soft, scrap, lead	9½— 9⅝
Battery plates (dry)	5 — 5½
Batteries, acid free	3¼
Magnesium	
Segregated solids	20 —21
Castings	19 —20
Miscellaneous	
Block tin	65 —67
No. 1 pewter	40 —42
No. 1 auto babbitt	37 —38
Mixed common babbitt	11 —12
Solder joints	14
Siphon tops	35
Small foundry type	14½
Monotype	13
Lino. and stereotype	12
Electrotype	10½
Hand picked type shells	7½
Lino. and stereo. dross	4½
Electro dross	3

MR. COST CUTTER SHOWS HOW

plating change cut copper polishing 95%

A large plating plant, turning out a variety of automotive and electrical appliance die cast parts, still had to buff 40% of the output after it had been copper plated.

As "headquarters" for coatings for metals, United Chromium was in a position to help. Installation of the improved pyrophosphate Unichrome Copper plating solution was suggested. This solution produces deposits that are exceptionally smooth and lustrous. Following the recommendation of the Unichrome Man, the company made the improvement.

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MORE WAYS UNITED CHROMIUM HELPS CUT COST OF COATING METALS

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TO FINISH IT BETTER AND SAVE

call in "The Unichrome Man"

UNICHROME Trade Mark

It pays to consult United Chromium on Metal Finishing Problems

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Scrap Prices Take New Nosedive

No. 1 Steel off $2 in Pittsburgh . . . Iron Age Composite dips $1.34 to $25.33 . . . Tonnage sales go begging in Chicago . . . Only bundles hold up in Detroit . . . Coast mill exports scrap.

Scrap prices continued their downward flight for still another week as almost all areas reported further drops. Reflecting the overall tendency, THE IRON AGE Scrap Composite fell $1.34 to $25.33, lowest point in 4 years.

Steelmaking, blast furnace and electric furnace grades were off at least $1 in Philadelphia and $2 in Pittsburgh in view of consumer disinterest. Drops were less spectacular in the Midwest, but movement was a trickle. Only bundles managed to hold to last week's prices in Detroit.

Rumors of export deals persisted in coastal areas. But little was actually happening except on the West Coast. There, even a mill got into the act, sold 10,000 tons of home scrap to a broker for export to Japan. Mill got $29 per ton for its material.

Pittsburgh — The market turned downward again this week. No. 1 heavy melting was off $2 per ton in face of consumer disinterest and declines in adjoining markets. Only exception to the trend is railroad specialties, which moved up $1 on basis of latest list. No. 1 railroad is off $2 as is low phos. Blast furnace scrap dropped $1. Cast is weaker.

Chicago—Tonnage sales went begging in the area again last week, with most grades holding a nominal price in the absence of any strong activity. Small electric furnace sales were continuing to hold their own, indicating that the grade has steadied somewhat after an uninterrupted slide. No. 1 heavy melting continues to be divided into factory and dealer categories, with dealer commanding a top of $26 delivered and industrial $28. No. 2 bundles seem almost obsolete, with practically no mill activity and nothing in prospect. Dealer offerings of $5 below the nominal market price have stirred up no activity. On small spot sales a few railroad grades were beginning to hit slightly above the market, though no tonnages were involved.

Philadelphia — Small sales in this district continue to be made at lower prices. Result this week is a decline of $1 to $2 in openhearth grades, electric furnace scrap and blast furnace materials. Increasing resistance to the low prices is being put up by dealers and more of them are laying down scrap—if they have room for it.

New York—"If this isn't a depression, what is it?" was the way one dealer summed up the sickly scrap market here this week. Reports that one ship in Port of New York was actually being loaded with export scrap failed to stir even the rumors of pending deals heard so often recently. Only cast continued to show any life.

Detroit—Bundles managed to cling to their price levels but all other grades took their cuts in a completely disinterested market. A bigger than average drop in low phos is attributed to a major consumer's price policy of grading low phos at $1 less than No. 1 bundles. Turnings are completely out, with some dealers paying as low as $5 a ton to their sources. The pessimists don't look for the bottom until March.

Birmingham—Southern steel mills were buying scrap again this week at unchanged prices, but still refused to take bundles. Dealers report that the apparent steadying of prices is bringing more scrap into the yards. There also is an indication dealers have decided not to hold onto their supplies for higher prices. Increased production in the district is expected to bring an increase in orders for scrap. Cast continues steady.

Cleveland—Sale of about 5000 tons of electric furnace material has established a No. 1 heavy melting market of $26, delivered in the Valley and $23 delivered Cleveland. Feeling is the market will go even lower before it levels off. Some brokers say market may dip to $16.

Cincinnati—February orders have already been covered and there is no activity in this market.

St. Louis—Another week of dullness in the scrap market. Steel mill ingot operations continued at 35.5 pct, and consumers have been buying only a scattering of carloads offered. Small offering of No. 2 heavy melting by one mill were at $1 higher.

Buffalo—A lower ingot rate for the district put the local scrap market further into the hole. With Wickwire-Spencer shutting down its openhearths along with Republic dealer sentiment was at a new low.

Boston—With the exception of a very small tonnage of No. 1 heavy melting, nothing was doing in the New England scrap trade. The No. 1 sale was for local delivery and is expected to be cleared up in a very short time. Result is a further decline in steelmaking grades.

West Coast—Even steel producers were getting into the scrap business last week to unload tonnage. A major California mill sold 10,000 tons of home scrap to a broker at $29 a ton, for export to Japan. It will be a part of several cargoes being readied for shipment. Other mills were buying fairly steadily at new lower prices announced late last month.

Hamilton, Ont.—Business continues at a standstill here. Mills mostly are out of the market and those that are buying are taking only token deliveries. There is not enough business to establish prices and quotations are only nominal. Dealers are heavily stocked and do not look for any substantial reduction in their holdings until the opening of navigation when they hope to see a boom in export demand. Purchasing agents decline to predict when mills again will enter the market on a large scale.

A SYMBOL OF LEADERSHIP IN IRON & STEEL SCRAP SINCE 1889

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IMPORT & EXPORT DIV. **LIVINGSTON & SOUTHARD, INC.** 50 Broadway, New York, N. Y. *Cable Address:* FORENTRACO

Scrap Prices

(Effective Feb. 16, 1954)

Pittsburgh

No. 1 hvy. melting	$26.00 to $27.00
No. 2 hvy. melting	23.00 to 24.00
No. 1 bundles	26.00 to 27.00
No. 2 bundles	21.00 to 22.00
Machine shop turn.	12.00 to 13.00
Mixed bor. and ms. turns.	12.00 to 13.00
Shoveling turnings	16.00 to 17.00
Cast iron borings	16.00 to 17.00
Low phos, punch'gs, plate	29.00 to 30.00
Heavy turnings	23.00 to 24.00
No. 1 RR. hvy. melting	28.00 to 29.00
Scrap rails, random lgth.	37.00 to 38.00
Rails 2 ft and under	43.00 to 44.00
RR. steel wheels	33.00 to 34.00
RR. spring steel	33.00 to 34.00
RR. couplers and knuckles	33.00 to 34.00
No. 1 machinery cast.	41.00 to 42.00
Cupola cast.	34.00 to 35.00
Heavy breakable cast.	29.00 to 30.00
Malleable	29.00 to 30.00

Chicago

No. 1 hvy. melting	$24.00 to $26.00
No. 2 hvy. melting	20.00 to 21.00
No. 1 factory bundles	27.00 to 28.00
No. 1 dealers' bundles	22.00 to 24.00
No. 2 dealers' bundles	19.00 to 20.00
Machine shop turn.	9.00 to 10.00
Mixed bor. and turn.	9.00 to 10.00
Shoveling turnings	11.00 to 12.00
Cast iron borings	11.00 to 12.00
Low phos. forge crops	32.00 to 33.00
Low phos. punch'gs, plate	29.00 to 31.00
Low phos. 3 ft and under	28.00 to 29.00
No. 1 RR. hvy. melting	28.00 to 29.00
Scrap rails, random lgth.	30.00 to 31.00
Rerolling rails	36.00 to 37.00
Rails 2 ft and under	38.00 to 40.00
Locomotive tires, cut	32.00 to 33.00
Cut bolsters & side frames	32.00 to 33.00
Angles and splice bars	34.00 to 35.00
RR. steel car axles	37.00 to 38.00
RR. couplers and knuckles	32.00 to 34.00
No. 1 machinery cast.	33.00 to 35.00
Cupola cast.	30.00 to 31.00
Heavy breakable cast.	25.00 to 26.00
Cast iron brake shoes	32.00 to 33.00
Cast iron car wheels	29.00 to 31.00
Malleable	36.00 to 37.00
Stove plate	24.00 to 26.00

Philadelphia Area

No. 1 hvy. melting	$24.00 to $25.00
No. 2 hvy. melting	21.00 to 22.00
No. 1 bundles	23.00 to 24.00
No. 2 bundles	19.00 to 20.00
Machine shop turn.	12.00 to 13.00
Mixed bor. short turn.	14.00 to 15.00
Cast iron borings	14.00 to 15.00
Shoveling turnings	18.00 to 19.00
Clean cast chem. borings	24.00 to 25.00
Low phos. 5 ft and under	28.00 to 30.00
Low phos. 2 ft and under	29.00 to 31.00
Low phos. punch'gs	29.00 to 31.00
Elec. furnace bundles	26.00 to 27.00
Heavy turnings	22.00 to 23.00
RR. steel wheels	30.00 to 32.00
RR. spring steel	30.00 to 32.00
Rails 18 in. and under	39.00 to 41.00
Cupola cast.	34.00 to 35.00
Heavy breakable cast.	35.50 to 37.50
Cast iron carwheels	38.00 to 39.00
Malleable	39.00 to 40.00
Unstripped motor blocks	27.00 to 28.00
No. 1 machinery cast.	38.00 to 40.00
Charging box cast.	35.00 to 36.00

Cleveland

No. 1 hvy. melting	$22.00 to $23.00
No. 2 hvy. melting	20.00 to 21.00
No. 1 bundles	22.00 to 23.00
No. 2 bundles	18.00 to 19.00
No. 1 busheling	22.00 to 23.00
Machine shop turn.	9.00 to 10.00
Mixed bor. and turn.	13.00 to 14.00
Shoveling turnings	13.00 to 14.00
Cast iron borings	13.00 to 14.00
Low phos. 2 ft and under	25.00 to 26.00
Drop forge flashings	22.00 to 23.00
No. 1 RR. heavy melting	28.00 to 29.00
Rails 3 ft and under	43.00 to 44.00
Rails 18 in. and under	44.00 to 45.00
Railroad grate bars	27.00 to 28.00
Steel axle turnings	24.00 to 25.00
Railroad cast.	40.00 to 41.00
No. 1 machinery cast.	41.00 to 42.00
Stove plate	35.00 to 36.00
Malleable	40.00 to 41.00

Iron and Steel Scrap

Going prices of iron and steel scrap as obtained in the trade by THE IRON AGE based on representative tonnages. All prices are per gross ton delivered to consumer unless otherwise noted.

Youngstown

No. 1 hvy. melting	$25.00 to $26.00
No. 2 hvy. melting	23.00 to 24.00
No. 1 bundles	25.00 to 26.00
No. 2 bundles	21.00 to 22.00
Machine shop turn.	12.00 to 13.00
Shoveling turnings	16.00 to 17.00
Cast iron borings	16.00 to 17.00
Low phos. plate	29.00 to 30.00

Buffalo

No. 1 hvy. melting	$24.00 to $25.00
No. 2 hvy. melting	20.50 to 21.50
No. 1 busheling	24.00 to 25.00
No. 1 bundles	24.00 to 25.00
No. 2 bundles	19.00 to 20.00
Machine shop turn.	12.50 to 13.50
Mixed bor. and turn.	14.50 to 15.50
Shoveling turnings	15.50 to 16.50
Cast iron borings	14.50 to 15.50
Low phos. plate	28.00 to 29.00
Scrap rails, random lgth.	31.00 to 32.00
Rails 2 ft and under	36.00 to 37.00
RR. steel wheels	34.00 to 35.00
RR. spring steel	34.00 to 35.00
RR. couplers and knuckles	34.00 to 35.00
No. 1 machinery cast.	34.00 to 35.00
No. 1 cupola cast.	29.00 to 30.00

Detroit

Brokers' buying prices per gross ton, on cars:

No. 1 hvy. melting	$17.00 to $18.00
No. 2 hvy. melting	16.00 to 17.00
No. 1 bundles, openhearth	20.00 to 21.00
No. 2 bundles	17.00 to 18.00
New busheling	17.00 to 18.00
Drop forge flashings	17.00 to 18.00
Machine shop turn.	6.00 to 7.00
Mixed bor. and turn.	9.00 to 10.00
Shoveling turnings	9.00 to 10.00
Cast iron borings	9.00 to 10.00
Low phos. punch'gs, plate	20.00 to 21.00
No. 1 cupola cast.	35.00
Heavy breakable cast.	24.00
Stove plate	28.00
Automotive cast	35.00

St. Louis

No. 1 hvy. melting	$25.00 to $26.00
No. 2 hvy. melting	24.00 to 25.00
No. 1 bundles	25.00 to 26.00
No. 2 bundles	21.00 to 22.00
Machine shop turn.	7.00 to 8.00
Cast iron borings	9.00 to 10.00
Shoveling turnings	9.00 to 10.00
No. 1 RR. hvy. melting	28.50 to 29.50
Rails, random lengths	33.00 to 34.00
Rails, 18 in. and under	38.00 to 39.00
Locomotive tires, uncut	31.00 to 32.00
Angles and splice bars	31.00 to 32.00
Std. steel car axles	35.00 to 36.00
RR. spring steel	31.00 to 32.00
Cupola cast.	37.00 to 38.00
Hvy. breakable cast.	25.00 to 26.00
Cast iron brake shoes	30.00 to 31.00
Stove plate	28.00 to 29.00
Cast iron car wheels	29.00 to 30.00
Malleable	34.00 to 35.00
Unstripped motor blocks	25.00 to 26.00

New York

Brokers' buying prices per gross ton, on cars:

No. 1 hvy. melting	$16.00 to $17.00
No. 2 hvy. melting	13.00 to 14.00
No. 2 bundles	11.00 to 12.00
Machine shop turn.	4.00 to 6.00
Mixed bor. and turn.	7.00 to 8.00
Shoveling turnings	8.00 to 9.00
Clean cast chem. borings	18.00 to 19.00
No. 1 machinery cast.	35.00 to 36.00
Mixed yard cast.	29.00 to 30.00
Charging box cast.	29.00 to 30.00
Heavy breakable cast.	29.00 to 30.00
Unstripped motor blocks	22.00 to 23.00

Birmingham

No. 1 hvy. melting	$24.00 to $25.00
No. 2 hvy. melting	22.00 to 23.00
No. 1 bundles	24.00 to 25.00
No. 2 bundles	21.00 to 22.00
No. 1 busheling	24.00 to 25.00
Machine shop turn.	14.00 to 15.00
Shoveling turnings	17.00 to 18.00
Cast iron borings	17.00 to 18.00
Electric furnace bundles	28.00 to 28.50
Bar crops and plate	31.00 to 32.00
Structural and plate, 2 ft.	31.00 to 32.00
No. 1 RR. hvy. melting	26.00 to 27.00
Scrap rails, random lgth.	34.00 to 35.00
Rails, 18 in. and under	40.00 to 41.00
Angles & splice bars	38.00 to 39.00
Std. steel axles	35.00 to 36.00
No. 1 cupola cast.	41.00 to 42.00
Stove plate	38.00 to 39.00
Cast iron car wheels	34.00 to 35.00
Charging box cast.	24.00 to 25.00
Heavy breakable	25.00 to 26.00
Unstripped motor blocks	32.00 to 33.00
Mashed tin cans	15.00 to 16.00

Boston

Brokers' buying prices per gross ton, on cars:

No. 1 hvy. melting	$14.00
No. 2 hvy. melting	$11.00 to 12.00
No. 1 bundles	12.00 to 13.00
No. 2 bundles	9.00 to 10.00
No. 1 busheling	12.00 to 13.00
Elec. furnace, 3 ft & under	13.00 to 14.00
Machine shop turn.	2.00
Mixed bor. and short turn.	2.00 to 3.00
Shoveling turnings	5.00 to 6.00
Clean cast chem. borings	13.00 to 14.00
No. 1 machinery cast.	27.00 to 28.00
Mixed cupola cast.	23.00 to 24.00
Heavy breakable cast.	26.00 to 26.50
Stove plate	20.00 to 21.00
Unstripped motor blocks	7.00 to 8.00

Cincinnati

Brokers' buying prices per gross ton, on cars:

No. 1 hvy. melting	$23.00 to $24.00
No. 2 hvy. melting	20.00 to 21.00
No. 1 bundles	23.00 to 24.00
No. 2 bundles	18.00 to 19.00
Machine shop turn.	10.00 to 11.00
Mixed bor. and turn.	13.50 to 14.50
Shoveling turnings	13.50 to 14.50
Cast iron borings	13.50 to 14.50
Low phos., 18 in. & under	31.00 to 32.00
Rails, random lengths	36.00 to 37.00
Rails, 18 in. and under	44.00 to 45.00
No. 1 cupola cast.	36.00 to 37.00
Hvy. breakable cast.	31.00 to 32.00
Drop broken cast.	42.00 to 43.00

San Francisco

No. 1 hvy. melting		$20.00
No. 2 hvy. melting		16.00
No. 1 bundles		19.00
No. 2 bundles		16.00
No. 3 bundles		12.00
Machine shop turn.		5.00
Cast iron borings		9.00
No. 1 RR. hvy. melting		23.00
No. 1 cupola cast.	$39.00 to	40.00

Los Angeles

No. 1 hvy. melting		$20.00
No. 2 hvy. melting		16.00
No. 1 bundles		19.00
No. 2 bundles		16.00
No. 3 bundles		12.00
Machine shop turn.		5.00
Shoveling turnings	$7.00 to	9.00
Cast iron borings	7.00 to	9.00
Elec. fur. 1 ft and under.		25.00
No. 1 RR. hvy. melting		20.00
No. 1 cupola cast.	39.00 to	40.00

Seattle

No. 1 hvy. melting		$25.00
No. 2 hvy. melting		21.00
No. 1 bundles		22.00
No. 2 bundles		16.00
No. 3 bundles		12.00
No. 1 cupola cast.		37.00
Mixed yard cast.		35.00

Hamilton, Ont.

No. 1 hvy. melting	$26.00
No. 2 hvy. melting	23.00
No. 1 bundles	26.00
No. 2 bundles	21.00
Mixed steel scrap	20.00
Bushelings	21.00
Bush., new fact prep'd.	24.00
Bush., new fact unprep'd.	20.00
Short steel turnings	15.00
Mixed bor. and turn.	15.00
Rails, remelting	35.00
Cast scrap	42.00

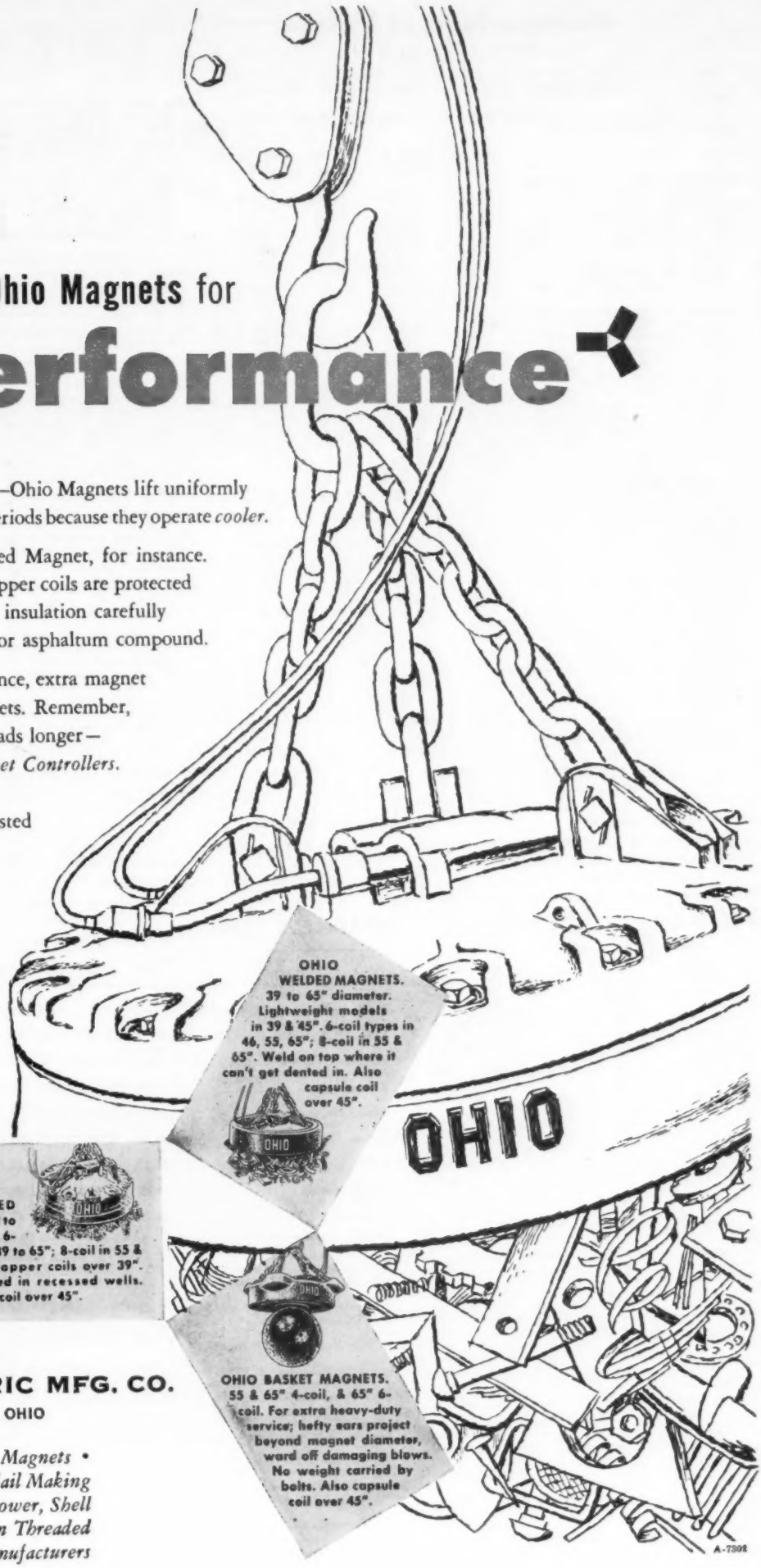
You can't beat **Ohio Magnets** for

performance

Morning . . . noon . . . night—Ohio Magnets lift uniformly larger loads over extended periods because they operate *cooler.*

Take this husky Ohio Bolted Magnet, for instance. Heavy-duty strap-wound copper coils are protected by longer-lasting inorganic insulation carefully sealed with non-remelting or asphaltum compound.

For extra magnet performance, extra magnet value—specify Ohio Magnets. Remember, Ohio Magnets lift larger loads longer—*especially with Ohio Magnet Controllers.*
Send for Bulletin 112.
Offices in principal cities listed in Classified Directory.



OHIO WELDED MAGNETS. 39 to 65" diameter. Lightweight models in 39 & 45". 6-coil types in 46, 55, 65"; 8-coil in 55 & 65". Weld on top where it can't get dented in. Also capsule coil over 45".

OHIO BOLTED MAGNETS. 12 to 65" diameter. 6-coil types in 39 to 65"; 8-coil in 55 & 65". Strap copper coils over 39". Bolts protected in recessed wells. Also capsule coil over 45".

OHIO BASKET MAGNETS. 55 & 65" 4-coil, & 65" 6-coil. For extra heavy-duty service; hefty ears project beyond magnet diameter, ward off damaging blows. No weight carried by bolts. Also capsule coil over 45".

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CHESTER BLAND
President

THE OHIO ELECTRIC MFG. CO.
5400 DUNHAM RD. • CLEVELAND, OHIO

Ohio Also Makes Separation Magnets • Heavy-Duty Electric Hoists • Nail Making Machines • Fractional Horsepower, Shell and Torque Motors • Precision Threaded Parts for Aircraft Engine Manufacturers

Comparison of Prices

(Effective Feb. 16, 1954)

Steel prices on this page are the average of various f.o.b. quotations of major producing areas: Pittsburgh, Chicago, Gary, Cleveland, Youngstown.

Price advances over previous week are printed in Heavy Type; declines appear in *Italics*.

	Feb. 16 1954	Feb. 9 1954	Jan. 19 1954	Feb. 17 1953
Flat-Rolled Steel: (per pound)				
Hot-rolled sheets	3.925¢	3.925¢	3.925¢	3.775¢
Cold-rolled sheets	4.775	4.775	4.775	4.575
Galvanized sheets (10 ga.)	5.275	5.275	5.275	5.075
Hot-rolled strip	3.925	3.925	3.925	3.725
Cold-rolled strip	5.513	5.513	5.513	5.20
Plate	4.10	4.10	4.10	3.90
Plates wrought iron	9.30	9.30	9.30	9.00
Stainl's C-R strip (No. 302)	41.50	41.50	41.50	36.75*
Tin and Terneplate: (per base box)				
Tinplate (1.50 lb.) cokes	$8.95	$8.95	$8.95	$8.95
Tinplate, electro (0.50 lb.)	7.65	7.65	7.65	7.65
Special coated mfg. terns	7.75	7.75	7.75	7.75
Bars and Shapes: (per pound)				
Merchant bars	4.16¢	4.16¢	4.16¢	3.95¢
Cold finished bars	5.20	5.20	5.20	4.925
Alloy bars	4.875	4.875	4.875	4.675
Structural shapes	4.10	4.10	4.10	3.85
Stainless bars (No. 302)	35.50	35.50	35.50	31.50*
Wrought iron bars	10.40	10.40	10.40	10.05
Wire: (per pound)				
Bright wire	5.525¢	5.525¢	5.525¢	5.225¢
Rails: (per 100 lb.)				
Heavy rails	$4.325	$4.325	$4.325	$3.775
Light rails	5.20	5.20	5.20	4.25
Semifinished Steel: (per net ton)				
Rerolling billets	$62.00	$62.00	$62.00	$59.00
Slabs, rerolling	62.00	62.00	62.00	59.00
Forging billets	75.50	75.50	75.50	70.50
Alloy blooms, billets, slabs	82.00	82.00	82.00	76.00
Wire Rod and Skelp: (per pound)				
Wire rods	4.525¢	4.525¢	4.525¢	4.325¢
Skelp	3.75	3.75	3.75	3.55
Finished Steel Composite: (per pound)				
Base price	4.634¢	4.634¢	4.634¢	4.376¢

* Add 4.7 pct.

	Feb. 16 1954	Feb. 9 1954	Jan. 19 1954	Feb. 17 1953
Pig Iron: (per gross ton)				
Foundry, del'd Phila.	$61.19	$61.19	$61.19	$60.69
Foundry, Valley	56.50	56.50	56.50	55.00
Foundry, Southern, Cin'ti	60.43	60.43	60.43	58.93
Foundry, Birmingham	52.88	52.88	52.88	51.38
Foundry, Chicago†	56.50	56.50	56.50	55.00
Basic del'd, Philadelphia	60.27	60.27	60.27	59.77
Basic, Valley furnace	56.00	56.00	56.00	54.50
Malleable, Chicago†	56.50	56.50	56.50	55.00
Malleable, Valley	56.50	56.50	56.50	55.00
Ferromanganese‡, cents per lb.	10.00¢	10.00¢	10.00¢	8.06¢

† The switching charge for delivery to foundries in the Chicago district is $1 per ton.

‡ Average of U. S. Prices quoted on Ferroalloy pages, 76 pct Mn basis.

Pig Iron Composite: (per gross ton)				
Pig iron	$56.59	$56.59	$56.59	$55.26
Scrap: (per gross ton)				
No. 1 steel, Pittsburgh	*$26.50*	$28.50	$30.50	$44.50
No. 1 steel, Phila. area	*24.50*	25.50	27.50	43.00
No. 1 steel, Chicago	*25.00*	26.00	27.50	43.50
No. 1 bundles, Detroit	*20.50*	19.50	21.50	40.20
Low phos., Youngstown	29.50	29.50	31.00	47.00
No. 1 mach'y cast, Pittsburgh	*41.50*	42.50	43.50	52.50
No. 1 mach'y cast, Philadel'a.	39.00	39.00	39.00	50.50
No. 1 mach'y cast, Chicago	34.00	34.00	35.50	46.50
Steel Scrap Composite: (per gross ton)				
No. 1 heavy melting scrap	*$25.33*	$26.67	$28.50	$43.67
Coke, Connellsville: (per net ton at oven)				
Furnace coke, prompt	$14.38	$14.38	$14.38	$14.75
Foundry coke, prompt	17.25	17.25	17.25	17.75
Nonferrous Metals: (cents per pound to large buyers)				
Copper, electrolytic, Conn.	29.75‡	29.75‡	29.75‡	24.50
Copper, Lake, Conn.	30.00	30.00	30.00	24.625
Tin, Straits, New York	85.00†	85.00*	84.50	$1.21½
Zinc, East St. Louis	9.25	9.50	9.50	11.50
Lead, St. Louis	12.80	12.80	12.80	13.30
Aluminum, virgin ingot	21.50	21.50	21.50	20.50
Nickel, electrolytic	63.08	63.08	63.08	63.08
Magnesium, ingot	27.75	27.75	27.75	24.50
Antimony, Laredo, Tex.	28.50	28.50	28.50	34.50

† Tentative. ‡ Average. * Revised.

Finished Steel Composite

Weighted index based on steel bars, shapes, plates, wire, rails, black pipe, hot and cold rolled sheets and strips.

Pig Iron Composite

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

Steel Scrap Composite

Average of No. 1 heavy melting steel scrap delivered to consumers at Pittsburgh, Philadelphia and Chicago.

PIG IRON

Dollars per gross ton, f.o.b., subject to switching charges.

Producing Point	Basic	Fdry.	Mall.	Bess.	Low Phos.
Bethlehem *B3*	$58.00	$58.50	$59.00	$59.50	.....
Birmingham *R3*	52.38	52.88	.....	.....	.....
Birmingham *W9*	52.38	52.88	.....	.....	.....
Birmingham *S5*	52.38	52.88	.....	.....	.....
Buffalo *R3*	56.00	56.50	57.00	.....	.....
Buffalo *H1*	56.00	56.50	57.00	.....	.....
Buffalo *W6*	56.00	56.50	57.00	.....	.....
Chicago *I4*	56.00	56.50	56.50	57.00	.....
Cleveland *A5*	56.00	56.50	56.50	57.00	61.00
Cleveland *R3*	56.00	56.50	56.50	.....	.....
Daingerfield *L3*	52.50	52.50	52.50	.....	.....
Duluth *I4*	56.00	56.50	56.50	57.00	.....
Erie *I4*	56.00	56.50	56.50	57.00	.....
Everett *M6*	.....	63.00	63.50	.....	.....
Fontana *K1*	62.00	62.50	.....	.....	.....
Geneva, Utah *C7*	56.00	56.50	.....	.....	.....
Granite City *G2*	57.90	58.40	58.90	.....	.....
Hubbard *Y1*	.....	.....	56.50	.....	.....
Minnequa *C6*	58.00	59.00	59.00	.....	.....
Monessen *P6*	56.00	.....	.....	.....	.....
Neville Isl. *P4*	56.00	56.50	56.50	.....	.....
Pittsburgh *U1*	56.00	.....	.....	57.00	.....
Sharpsville *S3*	56.00	56.50	56.50	57.00	.....
Steelton *B3*	58.00	58.50	59.00	59.50	64.00
Swedeland *A2*	58.00	58.50	59.00	59.50	.....
Toledo *I4*	56.00	56.50	56.50	57.00	.....
Troy, N. Y. *R3*	58.00	58.50	59.00	59.50	64.00
Youngstown *Y1*	.....	.....	56.50	57.00	.....
N. Tonawanda *T1*	.....	56.50	57.00	.....	.....

DIFFERENTIALS: Add 50¢ per ton for each 0.25 pct silicon over base (1.75 to 2.25 pct except low phos., 1.75 to 2.00 pct), 50¢ per ton for each 0.50 pct manganese over 1 pct, $2 per ton for .05 to 0.75 pct nickel, $1 for each additional 0.25 pct nickel. Subtract 38¢ per ton for phosphorus, content 0.70 and over.

Silvery Iron: Buffalo, *H1*, $68.25; Jackson, *J1*, *G1*, $67.00. Add $1.50 per ton for each 0.50 pct silicon over base (6.01 to 6.50 pct) up to 17 pct. Add $1 per ton for 0.75 pct. or more phosphorus. Add 75¢ for each 0.50 pct. manganese over 1.0 pct. Bessemer ferrosilicon prices are $1 over comparable silvery iron.

STAINLESS STEEL

Base price cents per lb., f.o.b. mill

Product	301	302	303	304	316	321	347	410	416	430
Ingots, rerolling	16.25	17.25	18.75	18.25	28.00	22.75	24.50	14.00	.....	14.25
Slabs, billets, rerolling	20.50–20.75	22.75	24.75	23.75	36.25	29.50	32.25	18.25	.....	18.50
Forg. discs, die blocks, rings	38.50	38.50	41.50	40.50	60.00	45.50	50.75	31.00	31.75	31.75
Billets, forging	29.50	29.75	32.25	31.00	46.50–46.75	35.25	39.50	24.00	24.50	24.50
Bars, wires, structurals	35.25	35.50	38.25	37.25	55.50	42.00	46.75	28.75	29.25	29.25
Plates	37.25	37.50	39.75	39.75	58.75–59.00	45.75–46.00	51.25	30.00	30.50–31.00	30.50
Sheets	46.25	46.50	48.75	48.75	64.50	55.50	60.75	40.75	41.25	43.50
Strip, hot-rolled	29.75	32.00	36.75	34.25	55.00	42.00	46.50	26.25	.....	27.00
Strip, cold-rolled	38.25	41.50	45.50	43.75	66.50	54.50	59.25	34.25	41.25	34.75

STAINLESS STEEL PRODUCING POINTS—*Sheets:* Midland, Pa., *C11;* Brackenridge, Pa., *A3;* Butler, Pa., *A7;* McKeesport, Pa., *U1;* Washington, Pa., *W2, J2;* Baltimore, *E1;* Middletown, O., *A7;* Massillon, O., *R3;* Gary, *U1;* Bridgeville, Pa., *U2;* New Castle, Ind., *I2;* Ft. Wayne, *J4;* Lockport, N. Y., *R4.*

Strip: Midland, Pa., *C11;* Cleveland, *A5;* Carnegie, Pa., *S9;* McKeesport, Pa., *F1;* Reading, Pa., *C2;* Washington, Pa., *W2;* W. Leechburg, Pa., *A3;* Bridgeville, Pa., *U2;* Detroit, *M2;* Canton-Massillon, O., *R3;* Middletown, O., *A7;* Harrison, N. J., *D3;* Youngstown, *C5;* Lockport, N. Y., *S4;* Sharon, Pa., *S1;* Butler, Pa., *A7;* Wallingford, Conn., *W1* (.25¢ per lb. higher); New Bedford, Mass., *R6.*

Bars: Baltimore, *A7;* Duquesne, Pa., *U1;* Munhall, Pa., *U1;* Reading, Pa., *C2;* Titusville, Pa., *L2;* Washington, Pa., *J2;* McKeesport, Pa., *U1, F1;* Bridgeville, Pa., *U2;* Dunkirk, N. Y., *A3;* Massillon, O., *R3;* Chicago, *U1;* Syracuse, N. Y., *C11;* Watervliet, N. Y., *A3;* Waukegan, *A5;* Lockport, N. Y., *S4;* Canton, O., *T5;* Ft. Wayne, *I4.*

Wire: Waukegan, *A5;* Massillon, O., *R3;* McKeesport, Pa., *F1;* Ft. Wayne, *J4;* Harrison, N. J., *D3;* Baltimore, *A7;* Dunkirk, *A3;* Monessen, *P1;* Syracuse, *C11;* Bridgeville, *U2.*

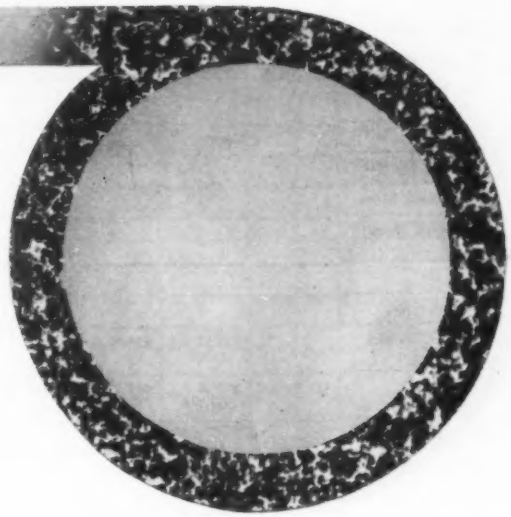
Structurals: Baltimore, *A7;* Massillon, O., *R3;* Chicago, Ill., *J4;* Watervliet, N. Y., *A3;* Syracuse, *C11.*

Plates: Brackenridge, Pa., *A3;* Chicago, *U1;* Munhall, Pa., *U1;* Midland, Pa., *C11;* New Castle, Ind., *I2;* Lockport, N. Y., *S4;* Middletown, *A7;* Washington, Pa., *J2;* Cleveland, Massillon, *R3;* Coatesville, Pa., *C15*

Forged discs, die blocks, rings: Pittsburgh, *C11;* Syracuse, *C11;* Ferndale, Mich., *A3;* Washington, Pa., *J2.*

Forging billets: Midland, Pa., *C11;* Baltimore, *A7;* Washington, Pa., *J2;* McKeesport, *F1;* Massillon, Canton, O., *R3;* Watervliet, *A3;* Pittsburgh, Chicago, *U1;* Syracuse, *C11.*

Are your Alloy Steel Bars in the PROFIT AREA for your MACHINE TOOLS?



It's the outer rim of a Republic carbon-corrected alloy steel bar that helps you make a profit. In the ordinary heat-treated bar this is a "decarb" area that usually must be removed before parts can be made from stock. In a Republic bar, the carbon has been restored after heat treating . . . right out to the edge.

You don't machine away good metal into chips and shavings. And that can make a substantial difference in your profits.

Republic's 3-Dimension metallurgical service will be glad to show you how you can get in on such savings as these. It works with your metallurgists and production people to adapt cold-drawn carbon-corrected alloy steel bars to your product. The combined extensive experience and abilities of Republic Mill, Field and Laboratory metallurgists are added to the knowledge and skills of your engineers.

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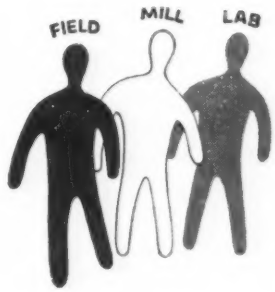

3-Dimension Metallurgical Service
combines the extensive experience and co-ordinated abilities of Republic's *Field, Mill* and *Laboratory* Metallurgists with the knowledge and skills of your own engineers. It has helped guide users of Alloy Steels in countless industries to the correct steel and its most efficient usage, IT CAN DO THE SAME FOR YOU.

Republic REPUBLIC STEEL
ALLOY STEELS

IRON AGE

STEEL PRICES

(Effective Feb. 16, 1954)

Italics identify producers listed in key at end of table. Base prices, f.o.b. mill, in cents per lb., unless otherwise noted. Extras apply.

		BILLETS, BLOOMS, SLABS			PIL-ING	SHAPES STRUCTURALS			STRIP					
		Carbon Rerolling Net Ton	Carbon Forging Net Ton	Alloy Net Ton	Sheet Steel	Carbon	Hi Str. Low Alloy	Carbon Wide-Flange	Hot-rolled	Cold-rolled	Hi Str. H.R. Low Alloy	Hi Str. C.R. Low Alloy	Alloy Hot-rolled	Alloy Cold-rolled
EAST	Bethlehem, Pa.			$82.00 *B3*		4.15 *B3*	6.20 *B3*	4.15 *B3*						
	Buffalo, N. Y.	$62.00 *B3*	$75.50 *B3,R3*	$82.00 *B3, R3*	4.925 *B3*	4.15 *B3*	6.20 *B3*	4.15 *B3*	3.925 *B3, R3*	5.45 *B3*	6.00 *B3*	8.425 *B3*		
	Claymont, Del.													
	Conshohocken, Pa.													
	Coatesville, Pa.													
	New Bedford, Mass.								4.05 *A2*		5.90 *A2*			
	Harrison, N. J.									6.00 *R6*				
	Johnstown, Pa.	$62.00 *B3*	$75.50 *B3*	$82.00 *B3*		4.15 *B3*	6.20 *B3*							12.00 *C11*
	Morrisville, Pa.													
	New Haven, Conn.									5.90 *D1* 6.20 *A5*				
	Phoenixville, Pa.					4.15 *P2*		4.95 *P2*						
	Sparrows Pt., Md.								3.925 *B3*	5.45 *B3*	6.00 *B3*	8.425 *B3*		
	Wallingford, Conn.									5.90 *W1*				
	Worcester, Mass.									6.30 *A5*				12.30 *A5* 12.45 *N7*
MIDDLE WEST	Alton, Ill.								4.10 *L1*					
	Ashland, Ky.								3.925 *A7*					
	Canton-Massillon, Dover, Ohio		$75.50 *R3*	$82.00 *R3*										12.00 *G4*
	Chicago, Ill.	$62.00 *U1*	$75.50 *R3, U1,W8*	$82.00 *U1, W8,R3*	4.925 *U1*	4.10 *U1, W8*	6.175 *U1, Y1*	4.10 *U1*	3.925 *A1, W8*	5.70 *A1*	5.95 *R3*		6.40 *W8*	
	Sterling, Ill.													
	Cleveland, Ohio		$75.50 *R3*							5.45 *A5, J3*		7.80 *J3* 8.15 *A5*		12.00 *A5* 12.15 *N7*
	Detroit, Mich.		$78.50 *R5*	$84.00 *R5*					4.125 *G3* 4.15 *M2*	5.65 *D1,D2, G3,M2, P11*	6.15 *G3*	7.90 *D2* 8.35 *G3*		
	Duluth, Minn.													
	Gary, Ind. Harbor, Indiana	$62.00 *U1*	$75.50 *U1*	$82.00 *U1, Y1*	4.925 *I3*	4.10 *I3, U1*	6.175 *U1, I3*		3.925 *I3, U1,Y1*	5.70 *I3*	5.95 *U1, I3* 6.45 *Y1*		6.40 *U1*	
	Granite City, Ill.													
	Kokomo, Ind.													
	Mansfield, Ohio													
	Middletown, Ohio									5.45 *A7*				
	Niles, Warren, Ohio Sharon, Pa.								3.925 *S1*	5.45 *S1, T4*	5.95 *S1*	7.65 *S1*	6.40 *S1*	12.00 *S1*
	Pittsburgh, Pa. Midland, Pa. Butler, Pa.	$62.00 *U1, J3*	$75.50 *J3, U1*	$82.00 *U1, C11*	4.925 *U1*	4.10 *J3, U1*	6.175 *J3, U1*	4.10 *U1*	3.925 *A7,P9* 3.95 *S7* 4.425 *S9*	5.45 *B4,J3, S7*		7.80 *J3*	6.40 *S9* 6.45 *S7*	12.00 *S9* 12.15 *S7*
	Portsmouth, Ohio													
	Weirton, Wheeling, Follansbee, W. Va.					4.35 *W3*			3.925 *W3*	5.45 *F3, W3*	5.95 *W3*	8.15 *W3*		
	Youngstown, Ohio			$82.00 *Y1, C10*		4.10 *Y1*	6.675 *Y1*		3.925 *R3, U1,Y1*	5.45 *R3,Y1* 5.95 *C5*	5.95 *U1, R3* 6.45 *Y1*	7.60 *R3* 8.30 *Y1*	6.40 *U1*	12.00 *C5*
WEST	Fontana, Cal.	$70.00 *K1*	$83.50 *K1*	$101.00 *K1*		4.75 *K1*	6.825 *K1*	5.30 *K1*	4.70 *K1*	7.35 *K1*	7.05 *K1*		7.80 *K1*	13.65 *K1*
	Geneva, Utah		$75.50 *C7*			4.10 *C7*	6.175 *C7*							
	Kansas City, Mo.					4.80 *S2*	6.875 *S2*		4.625 *S2*		6.65 *S2*		7.20 *S2*	
	Los Angeles, Torrance, Cal.		$94.50 *B2*	$102.00 *B2*		4.80 *B2, C7*	6.85 *B2*		4.675 *B2, C7*	7.50 *C1*			7.00 *B2*	
	Minnequa, Colo.					4.55 *C6*			5.025 *C6*					
	San Francisco, Niles, Pittsburg, Cal.		$94.50 *B2*			4.75 *B2* 4.91 *P9*	6.80 *B2*		4.675 *B2, C7*					
	Seattle, Wash.		$94.50 *B2, S11*			4.85 *B2*	6.90 *B2*							
SOUTH	Atlanta, Ga.								4.175 *A8*					
	Fairfield, Ala. Alabama City, Ala.	$62.00 *T2*	$75.50 *T2*			4.10 *R3, T2*	6.175 *T2*		3.925 *R3, T2*		5.95 *T2*			
	Houston, Tex.		$85.50 *S2*	$92.00 *S2*		4.60 *S2*			4.425 *S2*				6.80 *S2*	

Italics identify producers listed in key at end of table. Base prices, f.o.b. mill, in cents per lb., unless otherwise noted. Extras apply.

IRON AGE

STEEL PRICES

(Effective Feb. 16, 1954)

SHEETS									WIRE ROD	TINPLATE†		BLACK PLATE	
Hot-rolled 18 ga. & h'vy.	Cold-rolled	Galvanized 10 ga.	Enameling 12 ga.	Long Terne 10 ga.	Hi Str. Low Alloy H.R.	Hi Str. Low Alloy C.R.	Hi Str. Low Alloy Galv.	Hot-rolled 19 ga.		Coke* 1.25-lb. base box	Electro* 0.25-lb. base box	Holloware Enameling 29 ga.	
													Bethlehem, Pa.
3.925 *B3*	4.77 *B3*				5.90 *B3*	7.225 *B3*			4.525 *W6*				Buffalo, N. Y.
										† Special coated mfg. terne deduct 95¢ from 1.25-lb coke base box price. Can-making quality blackplate 55 to 128 lb deduct $2.20 from 1.25-lb coke base box. * COKES: 1.50-lb add 25¢. ELECTRO: 0.50-lb add 25¢; 0.75-lb add 65¢.			Claymont, Del.
													Coatesville, Pa.
4.05 *A2*					5.90 *A2*								Conshohocken, Pa.
													Harrisburg, Pa.
													Hartford, Conn.
									4.525 *B3*				Johnstown, Pa.
4.025 *U1*	4.875 *U1*									$8.80 *U1*	$7.50 *U1*		Morrisville, Pa.
													New Haven, Conn.
													Phoenixville, Pa.
3.925 *B3*	4.775 *B3*	5.275 *B3*			5.90 *B3*	7.225 *B3*	8.075 *B3*		4.625 *B3*	$8.80 *B3*	$7.50 *B3*		Sparrows Pt., Md.
									4.825 *A5*				Worcester, Mass.
													Trenton, N. J.
									4.70 *L1*				Alton, Ill.
3.925 *A7*		5.275 *A7*	5.175 *A7*										Ashland, Ky.
		5.275 *R1, R3*						5.05 *R1*					Canton-Massillon, Dover, Ohio
3.925 *A1, W8*					5.90 *U1*				4.525 *A5, N4, R3*				Chicago, Joliet, Ill.
									4.625 *N4*				Sterling, Ill.
3.925 *J3, R3*	4.775 *J3, R3*		5.175 *R3*		5.90 *J3, R3*	7.225 *J3, R3*			4.525 *A5*				Cleveland, Ohio
4.125 *G3* 4.15 *M2*	4.975 *G3*				6.10 *G3*	7.425 *G3*							Detroit, Mich.
3.925 *N5*													Newport, Ky.
3.925 *I3, U1, Y1*	4.775 *I3, U1, Y1*	5.275 *U1* 5.325 *I3*	5.175 *I3, U1*	5.675 *U1*	5.90 *U1, I3* 6.40 *Y1*	7.225 *U1* 7.725 *Y1*				$8.70 *I3, U1, Y1*	$7.40 *I3, U1*	6.10 *U1, Y1*	Gary, Ind. Harbor, Indiana
4.125 *G2*	4.975 *G2*	5.475 *G2*	5.875 *G2*								$7.60 *G2*	6.30 *G2*	Granite City, Ill.
4.025 *C9*		5.375 *C9*						5.025 *C9*					Kokomo, Ind.
				5.675 *E2*				5.05 *E2*					Mansfield, Ohio
	4.775 *A7*		5.175 *A7*	5.675 *A7*									Middletown, Ohio
3.925 *S1* 5.175 *N3*	5.00 *N3*	5.275 *N3*	6.525 *N3*	5.45 *S1* 5.675 *N3*	5.90 *S1*						$7.40 *R3*		Niles, Ohio Sharon, Pa.
3.925 *J3, U1, P6, A7*	4.775 *J3, U1, P6*	5.275 *U1*	5.175 *U1*		5.90 *J3, U1*	7.225 *J3, U1*	7.925 *U1*		4.525 *A5* 4.725 *P6*	$8.70 *J3, U1*	$7.40 *J3, U1*	6.10 *U1*	Pittsburgh, Pa. Midland, Pa. Butler, Pa.
									4.525 *P7*				Portsmouth, Ohio
3.925 *W3, W5*	4.775 *W3, W5, F3*	5.275 *W3, W5*		5.675 *W3, W5*	5.90 *W3*	7.225 *W3*				$8.70 *W3, W5*	$7.40 *W3, W5*	6.10 *F3, W5*	Weirton, Wheeling, Follansbee, W. Va.
3.925 *R3, U1, Y1*	4.775 *R3, Y1*				5.90 *U1, R3* 6.40 *Y1*	7.225 *R3* 7.725 *Y1*			4.525 *Y1*	$8.70 *R3*			Youngstown, Ohio
4.70 *K1*	5.875 *K1*				6.675 *K1*	8.275 *K1*			5.325 *K1*				Fontana, Cal.
4.025 *C7*													Geneva, Utah
								4.775 *C6*	4.865 *S2*				Kansas City, Mo.
4.625 *C7*		6.275 *C7*							5.325 *B2*				Los Angeles, Torrance, Cal.
									4.775 *C6*				Minnequa, Colo.
4.625 *C7*	5.725 *C7*	6.025 *C7*							5.175 *C7*	$9.45 *C7*	$8.15 *C7*		San Francisco, Niles, Pittsburg, Cal.
													Seattle, Wash.
													Atlanta, Ga.
3.925 *R3, T2*	4.775 *T2*	5.275 *R3, T2*			5.90 *T2*			5.125 *T2* 5.225 *R3*	4.525 *T2 R3*	$8.80 *T2*	$7.50 *T2*		Fairfield, Ala. Alabama City, Ala.
4.425 *S2*									4.925 *S2*				Houston, Texas

IRON AGE

STEEL PRICES

(Effective Feb. 16, 1954)

Italics identify producers listed in key at end of table. Base prices, f.o.b. mill, in cents per lb., unless otherwise noted. Extras apply.

		BARS						PLATES				WIRE
		Carbon Steel	Reinforcing	Cold Finished	Alloy Hot-rolled	Alloy Cold Drawn	Hi Str. H.R. Low Alloy	Carbon Steel	Floor Plate	Alloy	Hi Str. Low Alloy	Mfg's. Bright
EAST	Bethlehem, Pa.				4.875 *B3*	6.325 *B3*	6.225 *B3*					
	Buffalo, N. Y.	4.15 *B3* 4.18 *R3*	4.15 *B3,R3*	5.25 *B5*	4.875 *B3,R3*	6.325 *B3,B5*	6.225 *B3*	4.10 *B3*			6.25 *B3*	5.525 *W6*
	Claymont, Del.							4.10 *C4*		5.55 *C4*		
	Coatesville, Pa.							4.10 *L4*		5.55 *L4*		
	Conshohocken, Pa.							4.10 *A2*	5.15 *A2*		6.25 *A2*	
	Harrisburg, Pa.							4.10 *C3*	5.15 *C3*			
	Hartford, Conn.			5.75 *R3*		6.775 *R3*						
	Johnstown, Pa.	4.15 *B3*	4.15 *B3*		4.875 *B3*		6.225 *B3*	4.10 *B3*		5.55 *B3*	6.25 *B3*	5.525 *B3*
	Morrisville, Pa.	4.30 *U1*	4.30 *U1*		5.025 *U1*							
	Newark, N. J.			5.65 *W10*		6.65 *W10*						
	New Haven, Conn.											
	Camden, N. J.			5.65 *P10*		6.50 *P10*						
	Putnam, Conn.			5.75 *W10*								
	Sparrows Pt., Md.		4.15 *B3*					4.10 *B3*		5.55 *B3*	6.25 *B3*	5.625 *B3*
	Palmer, Worcester, Mansfield, Mass.			5.75 *B5* 6.10 *W11*		6.775 *B5*						5.625 *A5, W6*
	Readville, Mass.			5.75 *C14*								
MIDDLE WEST	Alton, Ill.	4.35 *L1*										5.70 *L1*
	Ashland, Ky.							4.10 *A7*				
	Canton-Massillon, Ohio	4.15 *R3*		5.20 *R2,R3*	4.875 *R3, T5*	6.325 *R2,R3, T5*						
	Chicago, Joliet, Ill.	4.15 *U1, N4,W8* 4.22 *R3*	4.15 *R3,N4*	5.20 *A5,W10, W8,B5,L2*	4.875 *U1, W8,R3*	6.325 *A5,W8, W10,L2, R3,B5*		4.10 *U1,W8*	5.15 *U1*	5.55 *U1*	6.25 *U1*	5.525 *A1, R3,N4,W7*
	Cleveland, Ohio	4.21 *R3*	4.15 *R3*	5.20 *A5,C13*		6.325 *A5, C13*		4.10 *J3,R3*	5.15 *J3*		6.25 *J3*	5.525 *A5, R3,C13*
	Detroit, Mich.	4.30 *R5* 4.35 *G3*		5.35 *R5,P8* 5.40 *B5* 5.45 *P3*	4.975 *R5* 5.075 *G3*	6.425 *R5* 6.475 *P8* 6.525 *B5,P3*	6.425 *G3*	4.30 *G3*			6.45 *G3*	
	Duluth, Minn.											5.525 *A5*
	Gary, Ind. Harbor, Crawfordsville	4.15 *I3, U1, Y1*	4.15 *I3, U1, Y1*	5.20 *R3*	4.875 *I3, U1, Y1*	6.325 *R3,M5*	6.225 *U1,I3* 6.725 *Y1*	4.10 *I3, U1, Y1*	5.15 *I3*	5.55 *U1*	6.25 *U1,I3* 6.75 *Y1*	5.625 *M4*
	Granite City, Ill.							4.30 *G2*				
	Kokomo, Ind.											5.625 *C9*
	Sterling, Ill.	4.25 *N4*	4.25 *N4*									5.625 *N4*
	Niles, Ohio Sharon, Pa.							4.10 *S1*		5.55 *S1*	6.25 *S1*	
	Pittsburgh, Pa. Midland, Pa.	4.15 *J3, U1*	4.15 *J3, U1*	5.20 *A5, J3, W10,R3,C8*	4.875 *U1,C11*	6.325 *A5,C11, W10,C8*	6.225 *J3, U1*	4.10 *J3, U1*	5.15 *U1*	5.55 *U1*	6.25 *J3, U1*	5.525 *A5, J3,P6*
	Portsmouth, Ohio											5.525 *P7*
	Weirton, Wheeling, Follansbee, W. Va.	4.15 *W3*						4.10 *W3*				
	Youngstown, Ohio	4.15 *U1, Y1* 4.20 *R3*	4.15 *R3, U1, Y1*	5.20 *Y1,F2*	4.875 *U1, Y1, C10*	6.325 *Y1, C10,F2*	6.225 *U1* 6.725 *Y1*	4.10 *R3, U1, Y1*			6.75 *Y1*	5.525 *Y1*
WEST	Emeryville, Cal.	4.90 *J5*	4.90 *J5*									
	Fontana, Cal.	4.85 *K1*	4.85 *K1*		5.925 *K1*		7.475 *K1*	4.75 *K1*		6.60 *K1*	6.95 *K1*	
	Geneva, Utah							4.10 *C7*			6.25 *C7*	
	Kansas City, Mo.	4.85 *S2*	4.85 *S2*		5.575 *S2*		6.925 *S2*					6.125 *S2*
	Los Angeles, Torrance, Cal.	4.85 *B2,C7*	4.85 *B2,C7*	6.65 *R3*	5.925 *B2*		6.925 *B2*					6.475 *B2*
	Minnequa, Colo.	4.60 *C6*	4.75 *C6*					4.95 *C6*				5.775 *C6*
	Portland, Ore.	4.90 *O2*										
	San Francisco, Niles, Pittsburg, Cal.	4.85 *C7,P9* 4.90 *B2*	4.85 *C7,P9* 4.90 *B2*				6.975 *B2*					6.475 *C7*
	Seattle, Wash.	4.90 *B2,N6*	4.90 *B2,S11*				6.975 *B2*	5.00 *B2*			7.15 *B2*	
SOUTH	Atlanta, Ga.	4.40 *A8*	4.40 *A8*									5.725 *A8*
	Fairfield, Ala. Alabama City, Ala.	4.15 *T2* 4.18 *R3*	4.15 *R3,T2*				6.225 *T2*	4.10 *R3,T2*			6.25 *T2*	5.525 *R3, T2*
	Houston, Ft. Worth, Lone Star, Tex.	4.55 *S2*	4.55 *S2*		5.375 *S2*			4.50 *L3* 4.60 *S2*				5.925 *S2*

Steel Prices

(Effective Feb. 16, 1954)

Key to Steel Producers

With Principal Offices

A1 Acme Steel Co., Chicago
A2 Alan Wood Steel Co., Conshohocken, Pa.
A3 Allegheny Ludlum Steel Corp., Pittsburgh
A4 American Cladmetals Co., Carnegie, Pa.
A5 American Steel & Wire Div., Cleveland
A6 Angell Nail & Chaplet Co., Cleveland
A7 Armco Steel Corp., Middletown, O.
A8 Atlantic Steel Co., Atlanta, Ga.

B1 Babcock & Wilcox Tube Div., Beaver Falls, Pa.
B2 Bethlehem Pacific Coast Steel Corp., San Francisco
B3 Bethlehem Steel Co., Bethlehem, Pa.
B4 Blair Strip Steel Co., New Castle, Pa.
B5 Bliss & Laughlin, Inc., Harvey, Ill.

C1 Calstrip Steel Corp., Los Angeles
C2 Carpenter Steel Co., Reading, Pa.
C3 Central Iron & Steel Co., Harrisburg, Pa.
C4 Claymont Products Dept., Claymont, Del.
C5 Cold Metal Products Co., Youngstown
C6 Colorado Fuel & Iron Corp., Denver
C7 Columbia Geneva Steel Div., San Francisco
C8 Columbia Steel & Shafting Co., Pittsburgh
C9 Continental Steel Corp., Kokomo, Ind.
C10 Copperweld Steel Co., Pittsburgh, Pa.
C11 Crucible Steel Co. of America, New York
C12 Cumberland Steel Co., Cumberland, Md.
C13 Cuyahoga Steel & Wire Co., Cleveland
C14 Compressed Steel Shafting Co., Readville, Mass.
C15 G. O. Carlson, Inc., Thorndale, Pa.

D1 Detroit Steel Corp., Detroit
D2 Detroit Tube & Steel Div., Detroit
D3 Driver Harris Co., Harrison, N. J
D4 Dickson Weatherproof Nail Co., Evanston, Ill.

E1 Eastern Stainless Steel Corp., Baltimore
E2 Empire Steel Co., Mansfield, O.

F1 Firth Sterling, Inc., McKeesport, Pa.
F2 Fitzsimmons Steel Corp., Youngstown
F3 Follansbee Steel Corp., Follansbee, W. Va.

G1 Globe Iron Co., Jackson, O.
G2 Granite City Steel Co., Granite City, Ill.
G3 Great Lakes Steel Corp., Detroit
G4 Greer Steel Co., Dover, O.

H1 Hanna Furnace Corp., Detroit

I2 Ingersoll Steel Div., Chicago
I3 Inland Steel Co., Chicago
I4 Interlake Iron Corp., Cleveland

J1 Jackson Iron & Steel Co., Jackson, O.
J2 Jessop Steel Corp., Washington, Pa.
J3 Jones & Laughlin Steel Corp., Pittsburgh
J4 Joslyn Mfg. & Supply Co., Chicago
J5 Judson Steel Corp., Emeryville, Calif.

K1 Kaiser Steel Corp., Fontana, Cal.
K2 Keystone Steel & Wire Co., Peoria
K3 Koppers Co., Granite City, Ill.

L1 Laclede Steel Co., St. Louis
L2 La Salle Steel Co., Chicago
L3 Lone Star Steel Co., Dallas
L4 Lukens Steel Co., Coatesville, Pa.

M1 Mahoning Valley Steel Co., Niles, O.
M2 McLouth Steel Corp., Detroit
M3 Mercer Tube & Mfg. Co., Sharon, Pa.
M4 Mid-States Steel & Wire Co., Crawfordsville, Ind.
M5 Monarch Steel Co., Inc., Hammond, Ind.
M6 Mystic Iron Works, Everett, Mass.

N1 National Supply Co., Pittsburgh
N2 National Tube Co., Pittsburgh
N3 Niles Rolling Mill Div., Niles, O.
N4 Northwestern Steel & Wire Co., Sterling, Ill.
N5 Newport Steel Corp., Newport, Ky.
N6 Northwest Steel Rolling Mills, Seattle
N7 Newman Crosby Steel Co., Pawtucket, R. I.

O1 Oliver Iron & Steel Co., Pittsburgh
O2 Oregon Steel Mills, Portland

P1 Page Steel & Wire Div., Monessen, Pa.
P2 Phoenix Iron & Steel Co., Phoenixville, Pa.
P3 Pilgrim Drawn Steel Div., Plymouth, Mich.
P4 Pittsburgh Coke & Chemical Co., Pittsburgh
P5 Pittsburgh Screw & Bolt Co., Pittsburgh
P6 Pittsburgh Steel Co., Pittsburgh
P7 Portsmouth Div., Detroit Steel Corp., Detroit
P8 Plymouth Steel Co., Detroit
P9 Pacific States Steel Co., Niles, Cal.
P10 Precision Drawn Steel Co., Camden, N. J.
P11 Production Steel Strip Corp., Detroit

R1 Reeves Steel & Mfg. Co., Dover, O.
R2 Reliance Div., Eaton Mfg. Co., Massillon, O.
R3 Republic Steel Corp., Cleveland
R4 Roebling Sons Co., John A., Trenton, N. J.
R5 Rotary Electric Steel Co., Detroit
R6 Rodney Metals, Inc., New Bedford, Mass.

S1 Sharon Steel Corp., Sharon, Pa.
S2 Sheffield Steel Corp., Kansas City
S3 Shenango Furnace Co., Pittsburgh
S4 Simonds Saw & Steel Co., Fitchburg, Mass.
S5 Sloss Sheffield Steel & Iron Co., Birmingham
S6 Standard Forging Corp., Chicago
S7 Stanley Works, New Britain, Conn.
S8 Superior Drawn Steel Co., Monaca, Pa.
S9 Superior Steel Corp., Carnegie, Pa.
S10 Sweet's Steel Co., Williamsport, Pa.
S11 Seidelhuber Steel Rolling Mills, Seattle

T1 Tonawanda Iron Div., N. Tonawanda, N. Y.
T2 Tennessee Coal & Iron Div., Fairfield
T3 Tennessee Products & Chem. Corp., Nashville
T4 Thomas Strip Div., Warren, O.
T5 Timken Steel & Tube Div., Canton, O.
T6 Tremont Nail Co., Wareham, Mass.
T7 Texas Steel Co., Fort Worth

U1 United States Steel Corp., Pittsburgh
U2 Universal-Cyclops Steel Corp., Bridgeville, Pa.

W1 Wallingford Steel Co., Wallingford, Conn.
W2 Washington Steel Corp., Washington, Pa.
W3 Weirton Steel Co., Weirton, W. Va.
W4 Wheatland Tube Co., Wheatland, Pa.
W5 Wheeling Steel Corp., Wheeling, W. Va.
W6 Wickwire Spencer Steel Div., Buffalo
W7 Wilson Steel & Wire Co., Chicago
W8 Wisconsin Steel Co., S. Chicago, Ill.
W9 Woodward Iron Co., Woodward, Ala.
W10 Wyckoff Steel Co., Pittsburgh
W11 Worcester Pressed Steel Co., Worcester, Mass.

Y1 Youngstown Sheet & Tube Co., Youngstown

PIPE AND TUBING

Base discounts (pct) f.o.b. mills. Base price about $200 per net ton.

STANDARD T. & C.	BUTTWELD														SEAMLESS							
	½ In.		¾ In.		1 In.		1¼ In.		1½ In.		2 In.		2½–3 In.		2 In.		2½ In.		3 In.		3½–4 In.	
	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.
Sparrows Pt. B3	24.25	8.0	27.25	12.0	29.75	15.5	32.25	16.5	32.75	17.5	33.25	18.0	34.75	18.0								
Youngstown R3	26.25	10.0	29.25	14.0	31.75	17.5	34.25	18.5	34.75	19.5	35.25	20.0	36.75	20.0								
Fontana K1	13.25	+2.0	16.25	1.0	18.75	4.5	21.25	5.5	21.75	6.5	22.25	7.0	23.75	7.0								
Pittsburgh J3	26.25	10.0	29.25	14.0	31.75	17.5	34.25	18.5	34.75	19.5	35.25	20.0	36.75	20.0	15.75	0.0	19.75	2.5	22.25	5.0	23.75	6.5
Alton, Ill. L1	24.25	8.0	27.25	12.0	29.75	15.5	32.25	16.5	32.75	17.5	33.25	18.0	34.75	18.0								
Sharon M3	26.25	10.0	29.25	14.0	31.75	17.5	34.25	18.5	34.75	19.5	35.25	20.0	36.75	20.0								
Morrisville N2	24.25	.....	27.25	.....	29.75	.....	32.25	.....	32.75	.....	33.25	.....	34.75	.....								
Pittsburgh N1	26.25	10.0	29.25	14.0	31.75	17.5	34.25	18.5	34.75	19.5	35.25	20.0	36.75	20.0	15.75	0.0	19.75	2.5	22.25	5.0	23.75	6.5
Wheeling W5	26.25	10.0	29.25	14.0	31.75	17.5	34.25	18.5	34.75	19.5	35.25	20.0	36.75	20.0								
Wheatland W4	26.25	10.0	29.25	14.0	31.75	17.5	34.25	18.5	34.75	19.5	35.25	20.0	36.75	20.0								
Youngstown Y1	26.25	10.0	29.25	14.0	31.75	17.5	34.25	18.5	34.75	19.5	35.25	20.0	36.75	20.0	15.75	0.0	19.75	2.5	22.25	5.0	23.75	6.5
Indiana Harbor Y1	25.25	9.0	28.25	13.0	30.75	16.5	33.25	17.5	33.75	18.5	34.25	19.0	35.75	19.0								
Lorain N2	26.25	10.0	29.25	14.0	31.75	17.5	34.25	18.5	34.75	19.5	35.25	20.0	36.75	20.0	15.75	0.0	19.75	2.5	22.25	5.0	23.75	6.5
EXTRA STRONG PLAIN ENDS																						
Sparrows Pt. B3	27.75	13.0	31.75	17.0	33.75	20.5	34.25	19.5	34.75	20.5	35.25	21.0	35.75	20.0								
Youngstown R3	29.75	15.0	33.75	19.0	35.75	22.5	36.25	21.5	36.75	22.5	37.25	23.0	37.75	22.0								
Fontana K1	16.75	.....	20.75	.....	22.75	.....	23.25	.....	23.75	.....	24.25	.....	24.75	.....								
Pittsburgh J3	29.75	15.0	33.75	19.0	35.75	22.5	36.25	21.5	36.75	22.5	37.25	23.0	37.75	22.0	16.25	0.75	20.75	3.75	23.75	6.75	28.75	9.75
Alton, Ill. L1	27.75	13.0	31.75	17.0	33.75	20.5	34.25	19.5	34.75	20.5	35.25	21.0	35.75	20.0								
Sharon M3	29.75	15.0	33.75	19.0	35.75	22.5	36.25	21.5	36.75	22.5	37.25	23.0	37.75	22.0								
Pittsburgh N1	29.75	15.0	33.75	19.0	35.75	22.5	36.25	21.5	36.75	22.5	37.25	23.0	37.75	22.0	16.25	0.75	20.75	3.75	23.75	6.75	28.75	9.75
Wheeling W5	29.75	15.0	33.75	19.0	35.75	22.5	36.25	21.5	36.75	22.5	37.25	23.0	37.75	22.0								
Wheatland W4	29.75	15.0	33.75	19.0	35.75	22.5	36.25	21.5	36.75	22.5	37.25	23.0	37.75	22.0								
Youngstown Y1	29.75	15.0	33.75	19.0	35.75	22.5	36.25	21.5	36.75	22.5	37.25	23.0	37.75	22.0	16.25	0.75	20.75	3.75	23.75	6.75	28.75	9.75
Indiana Harbor Y1	28.75	14.0	32.75	18.0	34.75	21.5	35.25	20.5	35.75	21.5	36.25	22.0	36.75	21.0								
Lorain N2	29.75	15.0	33.75	19.0	35.75	22.5	36.25	21.5	36.75	22.5	37.25	23.0	37.75	22.0	16.25	0.75	20.75	3.75	23.75	6.75	28.75	9.75

Galvanized discounts based on zinc, at 11¢ per lb, East St. Louis. For each 1¢ change in zinc, discounts vary as follows: ½ in., ¾ in., and 1 in., 1 pt.; 1¼ in., 1½ in., 2 in., ¾ pt.; 2½ in., 3 in., ½ pt. Calculate discounts on even cents per lb of zinc, i.e., if zinc is 16.51¢ to 17.50¢ per lb, use 17¢. Jones & Laughlin discounts apply only when zinc price changes 1¢.

Threads only buttweld and seamless, 2¼ pts. higher discount. Plain ends, buttweld and seamless, 3 in. and under, 4½ pts. higher discount. Buttweld jobbers' discount, 5 pct. East St. Louis zinc price now 9.50¢.

Steel Prices

(Effective Feb. 16, 1954)

CLAD STEEL

	Plate	Sheet
Stainless-carbon		
No. 304, 20 pct.		
Coatesville, Pa., *L4*	*32.7	
Washington, Pa., *J2*	....	
Claymont, Del. *C4*	....	
New Castle, Ind. *I3*	....	32.50
Nickel-carbon		
10 pct. Coatesville, Pa. *L4*	37.5	
Inconel-carbon		
10 pct. Coatesville, Pa. *L4*	46.10	
Monel-carbon		
10 pct. Coatesville, Pa. *L4*	38.90	
Aluminized steel sheets, hot dip, Butler, Pa., *A7*	....	....

* Includes annealing and pickling, sandblasting.

CAST IRON WATER PIPE

Per Net Ton

6 to 24-in., del'd Chicago $111.80 to $115.30
6 to 24-in., del'd N. Y. .. 115.00 to 116.00
6 to 24-in., Birmingham. 98.00 to 102.50
6-in. and larger f.o.b. cars, San Francisco, Los Angeles, for all rail shipments; rail and water shipments less .....$129.50 to $131.50

Class "A" and gas pipe, $5 extra; 4-in. pipe is $5 a ton above 6-in.

ELECTRICAL SHEETS

22 Ga. H-R cut length F.o.b. Mill Cents Per Lb.	Armature	Elec.	Motor	Dynamo	Transf. 72	Transf. 65	Transf. 58
Beech Bottom *W5*	....	8.75	9.75	10.65	11.60	12.15	12.65
Brackenridge *A3*	....	8.75	9.75	10.65	11.60	.....	12.65
Granite City *G2*	8.60	9.20	10.20	.....	.....	.....	.....
Ind. Harbor *I3*	8.15	8.75	9.75	.....	.....	.....	.....
Mansfield *E2*	8.15	8.75	9.75	10.65	.....	.....	.....
Newport, Ky. *N5*	8.15	8.75	9.75	10.65	11.60	.....	.....
Niles, O, *N3*	8.15	8.75	9.75	.....	.....	.....	.....
Vandergrift *U1*	8.15	8.75	9.75	10.65	11.60	12.15	12.65
Warren, O. *R3*	8.15	8.75	9.75	.....	.....	.....	.....
Zanesville *A7*	8.15	8.75	9.75	10.65	11.60	12.15	12.65

TOOL STEEL

F.o.b. Mill

W	Cr	V	Mo	Co	Base per lb
18	4	1	—	—	$1.48
18	4	1	—	5	3.16
18	4	2	—	—	1.64
1.5	4	1.5	8	—	.895
6	4	2	6	—	1.005

High-carbon chromium ..... .70
Oil hardened manganese ..... .39
Special carbon ..... .355
Extra carbon ..... .30
Regular carbon ..... .25

Warehouse prices on and east of Mississippi are 3.5¢ per lb. higher. West of Mississippi, 5.5¢ higher.

MERCHANT WIRE PRODUCTS

F.o.b. Mill	Standard & Coated Nails	Woven Wire Fence 9-15½ ga.	"T" Fence Posts	Single Loop Bale Ties	Twisted Barbless Wire	Galv. Barbed Wire	Merch. Wire Ann'ld ¢/lb.	Merch. Wire* Galv. ¢/lb.
	Col	Col	Col	Col	Col	Col		
Alabama City *R3*	131	140	...	149	...	153	6.675	7.075
Aliquippa, Pa. *J3*	131	143	...	...	...	150	6.675	7.20
Atlanta *A8*	133	145	...	151	...	158	6.775	7.30
Bartonville *K2*	131	143	...	...	...	156	....	....
Buffalo *W6*	....	....	....	....	....	....	....	....
Chicago, Ill. *N4*	131	142	...	149	155	155	6.675	7.175
Cleveland *A6*	137	....	....	....	....	....	....	....
Cleveland *A5*	....	....	....	....	....	....	6.675	....
Crawfrdsvl. *M4*	133	145	...	151	...	159	6.775	7.325
Donora, Pa. *A5*	131	140	...	149	...	153	6.675	7.075
Duluth *A5*	131	140	145	149	...	153	6.675	7.075
Fairfield, Ala. *T2*	131	140	...	149	...	153	6.675	7.075
Galveston *D4*	139	148	....	....	....	....	....	....
Houston *S2*	139	151	....	....	....	164	7.075	7.475
Johnstn., Pa. *B3*	131	143	145	...	156	156	6.675	7.225
Joliet, Ill. *A5*	131	140	...	149	...	153	6.675	7.075
Kokomo, Ind. *C9*	133	142	...	151	...	155	6.775	7.175
Los Angeles *B2*	....	....	....	....	....	....	7.625	....
Kansas City *S2*	143	155	...	161	...	168	7.275	7.825
Minnequa *C6*	136	148	150	154	162	162	6.925	7.325
Monessen *P6*	131	145	....	....	....	157	6.675	7.225
Moline, Ill. *R3*	....	....	145	....	....	....	....	....
Pittsburg, Cal. *C7*	150	163	...	173	173	173	7.625	8.025
Portsmouth *P7*	....	....	....	....	....	....	6.675	....
Rankin, Pa. *A5*	131	140	....	....	....	153	6.675	7.075
So. Chicago *R3*	131	140	145	149	...	153	6.675	7.075
S. San Fran. *C6*	....	....	....	....	....	173	....	....
Sparrows Pt. *B3*	133	....	....	151	158	158	6.775	7.325
Struthers, O. *Y1*	....	....	....	....	....	....	6.675	7.175
Worcester *A5*	137	....	....	....	....	....	6.975	....
Williamsport, Pa. *S10*	133	....	158	....	....	....	....	....

Cut Nails, carloads, base $8.00 per keg (less 20¢ to jobbers), at Conshohocken, Pa. (*A2*).

* Alabama City and So. Chicago don't include zinc extra. Galvanized products computed with zinc at 11.0¢ per lb.

WAREHOUSES

Base price, f.o.b., dollars per 100 lb.

Cities	City Delivery Charge	Sheets: Hot-Rolled	Sheets: Cold-Rolled (15 gage)	Sheets: Galvanized (10 gage)	Strip: Hot-Rolled	Strip: Cold-Rolled	Plates	Shapes: Standard Structural	Bars: Hot-Rolled	Bars: Cold-Finished	Alloy Bars: Hot-Rolled A 4615 As rolled	Alloy Bars: Hot-Rolled A 4140 Annealed	Alloy Bars: Cold-Drawn A 4615 As rolled	Alloy Bars: Cold-Drawn A 4140 Annealed
Baltimore	$.20	6.20	7.64	7.78	7.00	.....	6.85	6.98	6.86	8.17	.....	.....	.....	.....
Birmingham	.15	6.15	7.00	8.00[4]	6.30	.....	6.35	6.35	6.15	8.75	.....	.....	.....	.....
Boston	.20	6.80	7.83	9.18	7.13	9.22–9.38[5]	7.13	7.06	6.87	8.35	.....	12.05	.....	14.50
Buffalo	.20	6.20–6.35	7.15–7.70	9.00–9.01	6.65–6.79	.....	6.65–6.68	6.55–6.80	6.35	7.70	.....	11.95	.....	14.25
Chicago	.20	6.18	7.12	8.00	6.42	.....	6.33–6.38	6.46	6.28	7.30	.....	11.75	.....	14.25
Cincinnati	.15	6.51	7.19	8.42	6.72	.....	6.80	6.93	6.58	7.06	.....	12.17	.....	14.87
Cleveland	.20	6.18	7.12	7.90	6.58	.....	6.50	6.79	6.34	7.40	.....	11.89	.....	14.39
Denver	.....	7.95	8.85	10.47	8.20	9.55	7.95	7.95	8.05	9.05	.....	16.05	.....	15.75
Detroit	.20	6.35–6.45	7.29–7.31	8.27	6.60–7.71	7.36	6.80	6.91–6.93	6.56	7.60	.....	11.92	.....	13.44–14.62
Houston	.20	7.15	7.60–7.85	9.40	7.45	.....	7.20	7.35	7.45	9.30	.....	12.95	.....	.....
Kansas City	.20	6.85	7.79	8.67	7.09	.....	7.00–7.05	7.13	6.95	8.08	.....	12.42	.....	.....
Los Angeles	.20	7.25	9.00	9.35	7.56	10.75–11.30	7.20	7.35	7.15–7.25	9.10–9.75	13.20	13.05	15.75	15.85–16.05
Memphis	.10	6.79	7.69	.....	6.90	.....	7.01	7.09	6.88	7.80–8.31	.....	.....	.....	.....
Milwaukee	.20	6.35	7.12	8.00–8.17	6.59–6.60	8.07	6.50–6.58	6.61–6.63	6.46	7.97	.....	11.92	.....	14.42
New Orleans	.15	6.51	7.41	9.32	6.63	10.42	6.73	6.81–7.45	6.60	8.42–10.42	.....	.....	.....	.....
New York	.30	6.78	7.75[4]–8.20	8.42–9.00[3]	7.16	9.05	6.99	6.90	7.06	8.43	12.29	12.14	14.54	14.64
Norfolk	.20	6.90	.....	.....	7.20	.....	7.15	7.20	7.20	8.50	.....	.....	.....	.....
Philadelphia	.25	6.60	7.38	8.15	7.02	.....	6.63	6.67	6.87	8.24	12.04	11.89	14.29	14.39
Pittsburgh	.20	5.95–6.18	6.82–7.12	7.95–8.00	6.20–6.55	.....	6.03–6.33	6.07–6.46	5.98–6.28	7.65	.....	11.45–11.75	.....	13.75–14.25
Portland	.10	8.15–8.95	8.70–9.85	9.40	7.90	.....	7.55	7.50	7.60	10.05	.....	.....	.....	.....
Salt Lake City	.20	9.05	10.80	10.65	9.35	11.25	8.70	8.85	9.10–9.20	11.25	.....	.....	.....	.....
San Francisco	.20	7.35	8.70	9.90–10.15	7.60	10.35	7.20	7.25	7.15	9.75–9.85	13.20	12.80–13.05	15.50	15.55–16.05
Seattle	.20	8.15	9.50	9.80	8.00	.....	7.60	7.50	7.60	10.65	.....	13.40	.....	16.00
St. Louis	.20	6.48	7.42	8.30	6.72	8.47	6.73	6.86	6.58	7.50–7.70	12.20	12.05	12.20	14.55
St. Paul	.15	6.84	7.78	8.66	7.08	.....	6.99	7.12	6.94	8.06	.....	12.42	.....	.....

Base Quantities (Standard unless otherwise keyed): Cold finished bars; 2000 lb or over. Alloy bars; 1000 to 1999 lb. All others; 2000 to 9999 lb. All HR products may be combined for quantity. All galvanized sheets may be combined for quantity. CR sheets may not be combined with each other or with galvanized sheets, for quantity.

Exceptions: (1)500 to 1499 lb. (2)20,000 lb or over. (3)450 to 1499 lb. (4)500 to 9999 lb. (5)1000 lb or over. (6)400 to 1499 lb.

C-R SPRING STEEL

Cents Per Lb. F.o.b. Mill	CARBON CONTENT 0.26–0.40	0.41–0.60	0.61–0.80	0.81–1.05	1.06–1.35
Bridgeport, Conn. *S7**	5.75	7.65	8.60	10.55	12.85
Carnegie, Pa. *S9*	....	7.65	8.60	10.55	12.85
Cleveland *A5*	5.45	7.65	8.60	10.55	12.85
Detroit *D1*	5.65	7.85	8.45	10.55	.....
Detroit *D2*	5.65	7.85	8.80	....	....
Harrison, N. J. *C11*	....	....	8.90	10.85	13.15
New Castle, Pa. *B4*	5.80	8.00	8.60	....	....
New Haven, Conn. *D1*	5.90	7.95	8.55	10.65	....
Riverdale, Ill. *A1*	5.70	7.80	8.75	10.70	13.00
Sharon, Pa. *S1*	5.45	7.65	8.60	10.55	12.85
Trenton *R4*	....	7.95	8.90	10.85	13.15
Wallingford *W1*	6.20	7.95	8.90	10.85	13.15
Warren, Ohio *T4*	5.45	7.65	8.60	10.55	12.85
Weirton, W. Va. *W3*	5.45	7.65	8.60	10.55	12.85
Worcester, Mass. *A5*	6.30	7.95	8.90	10.85	13.15
Youngstown *C5*	....	8.00	8.60	10.55	12.85

* Sold on Pittsburgh base.

BOILER TUBES

$ per 100 ft. carload lots, cut 10 to 24 ft. F.o.b. Mill	Size: OD-In.	Size: B.W. Ga.	Seamless: H.R.	Seamless: C.D.	Elec. Weld: H.R.	Elec. Weld: C.D.
Babcock & Wilcox	2	13	30.08	36.28	26.51	31.98
	2½	12	40.51	48.86	35.70	43.07
	3	12	45.92	55.39	41.23	49.73
	3½	11	53.60	64.65	48.13	58.06
	4	10	65.91	79.50	63.92	77.10
National Tube	2	13	....	32.98	26.51	.....
	2½	12	36.82	44.41	35.70	.....
	3	12	42.52	51.28	41.23	.....
	3½	11	49.63	59.87	48.13	.....
	4	10	65.91	79.50	63.92	.....
Pittsburgh Steel	2	13	27.34	32.98	.....	.....
	2½	12	36.82	44.41	.....	.....
	3	12	42.52	51.28	.....	.....
	3½	11	49.63	59.87	.....	.....
	4	10	65.91	79.50	.....	.....

Miscellaneous Prices

(Effective Feb. 16, 1954)

RAILS, TRACK SUPPLIES

F.o.b. Mill Cents Per Lb	No. 1 Std. Rails	Light Rails	Joint Bars	Track Spikes	Screw Spikes	Tie Plates	Track Bolts Treated
Bessemer *U1*	4.325	5.20	5.275	....	....	....	....
Chicago *R3*	....	....	....	7.05	....	....	....
Cleveland *R3*	....	....	....	....	....	....	....
Ensley *T2*	4.325	5.20	....	....	....	....	....
Fairfield *T2*	....	5.20	....	....	....	5.125	....
Gary *U1*	4.325	5.20	....	....	....	5.125	....
Ind. Harbor *I3*	4.325	....	5.275	7.05	....	5.125	....
Johnstown *B3*	....	5.20	....	....	....	....	....
Joliet *U1*	....	5.20	5.275	....	....	....	....
Kansas City *S2*	....	....	....	7.30	....	....	11.00
Lackawanna *B3*	4.325	5.20	5.275	....	....	5.125	....
Lebanon *B3*	....	....	....	7.05	10.50	....	11.00
Minnequa *C6*	4.325	5.70	5.275	7.05	....	5.125	11.00
Pittsburgh *O1*	....	....	....	....	10.50	....	11.00
Pittsburgh *P5*	....	....	....	....	10.50	....	11.00
Pittsburgh *J3*	....	....	....	7.05	....	....	....
Pitt'g, Cal. *C7*	....	....	....	....	....	5.275	....
Seattle *B2*	....	....	....	7.55	....	5.275	11.50
Steelton *B3*	4.325	....	5.275	....	....	5.125	....
Struthers *Y1*	....	....	....	....	....	....	....
Torrance *C7*	....	....	....	....	....	5.275	....
Youngstown *R3*	....	....	....	7.05	....	....	....

LAKE SUPERIOR ORES

51.50% Fe; natural content, delivered lower Lake ports. Prices effective July 1, 1953, to end of season.

	Gross Ton
Openhearth lump	$11.15
Old range, bessemer	10.30
Old range, nonbessemer	10.15
Mesabi, bessemer	10.05
Mesabi, nonbessemer	9.90
High phosphorus	....

Prices based on upper Lake rail freight rates, Lake vessel freight rates, handling and unloading charges, and taxes thereon, in effect on June 24, 1953. Increases or decreases after such date are for buyer's account.

COKE

	Net-Ton
Furnace, beehive (f.o.b. oven) Connellsville, Pa.	$14.25 to $14.50
Foundry, beehive (f.o.b. oven) Connellsville, Pa.	$16.50 to $17.00
Foundry, oven coke	
Buffalo, del'd	$28.08
Chicago, f.o.b.	24.50
Detroit, f.o.b.	25.50
New England, del'd	26.05
Seaboard, N. J., f.o.b.	24.00
Philadelphia, f.o.b.	23.95
Swedeland, Pa., f.o.b.	23.85
Painesville, Ohio, f.o.b.	24.00
Erie, Pa., f.o.b.	25.00
Cleveland, del'd	27.43
Cincinnati, del'd	26.56
St. Paul, f.o.b.	23.75
St. Louis, f.o.b.	26.00
Birmingham, del'd	23.21
Lone Star, Tex., f.o.b.	18.50

ELECTRODES

Cents per lb, f.o.b. plant threaded electrodes with nipples, unboxed

Diam. in in.	Length in in.	Cents Per lb.
	GRAPHITE	
24	84	20.50
20	72	20.00
12, 14, 18	72	20.50
7 to 10	60	21.00
6	60	23.25
4	40	26.00
3	40	27.25
2½	30	28.00
2	24	43.50
	CARBON	
40	100, 110	8.95
35	110	8.95
30	110	8.95
24	72 to 84	9.10
20	90	8.95
17	72	9.10
14	72	9.50
10, 12	60	10.20
8	60	10.55

BOLTS, NUTS, RIVETS, SCREWS

Consumer Prices

(Base, discount, f.o.b. mill, Pittsburgh, Cleveland, Birmingham or Chicago)

Nuts, Hot Pressed, Cold Punched—Sq.

	Pct Off List Less Keg Reg.	K.	Less Keg Hvy.	K.
½ in. & smaller	+2	15	+2	18
9/16 in. & ⅝ in.	+7	11	+32*	+10*
¾ in. to 1½ in. inclusive	+8	10	+27**	+6**
1⅝ in. & larger	+9	9	+27	+6

* 9/16 to ¾ in.
** ⅞ to 1½ in.

Nuts, Hot Pressed—Hexagon

½ in. & smaller	11	26	8	23
9/16 in. & ⅝ in.	2	18	+20	net
¾ in. to 1½ in. inclusive	+6	12	+25	+4
1⅝ in. & larger	+8	10	+25	+4

Nuts, Cold Punched—Hexagon

½ in. & smaller	11	26	8	23
9/16 in. & ⅝ in.	9	24	+2	15
¾ in. to 1½ in. inclusive	+1	16	+9	9
1⅝ in. & larger	+16	3	+20	net

Nuts, Semi-Finished—Hexagon

½ in. & smaller	23	36	14	33
9/16 in. & ⅝ in.	18	32	4	20
¾ in. to 1½ in. inclusive	8	23	+8	10
1⅝ in. & larger	+14	5	+20	net
	Light			
7/16 in. & smaller	33	43		
½ in. thru ⅝ in.	26	37		
¾ in. to 1½ in. inclusive	18	30		

Stove Bolts *Pct Off List*

Packaged, steel, plain finished	44½—10
Packaged, plain finish	25½—10
Bulk, plain finish**	59*

*Discounts apply to bulk shipments in not less than 15,000 pieces of a size and kind where length is 3-in. and shorter; 5000 pieces for lengths longer than 3-in. For lesser quantities, packaged price applies.

**Zinc, Parkerized, cadmium or nickel plated finishes add 6¢ per lb net. For black oil finish, add 2¢ per lb net.

Rivets *Base per 100 lb*

½ in. & larger	$8.90
	Pct Off List
7/16 in. and smaller	30

Cap and Set Screws

(In bulk)	Pct Off List
Hexagon head cap screws, coarse or fine thread, ¼ in. thru ⅝ in. x 6 in., SAE 1020, bright	40
¾ in. thru 1 in. up to & including 6 in.	26
¼ in. thru ⅝ in. x 6 in. & shorter high C double heat treat	43
¾ in. thru 1 in. up to & including 6 in.	33
Milled studs	17
Flat head cap screws, listed sizes	12
Fillister head cap, listed sizes	7
Set screws, sq head, cup point, 1 in. diam. and smaller x 6 in. & shorter	37

Machine and Carriage Bolts

	Pct Off List Less Case	C.
½ in. & smaller x 6 in. & shorter	4	20
9/16 in. & ⅝ in. x 6 in. & shorter	5	21
¾ in. & larger x 6 in. & shorter	3	19
All diam. longer than 6 in.	+4	13
Lag, all diam. x 6 in. & shorter	12	27
Lag, all diam. longer than 6 in.	8	23
Plow bolts	30	..

REFRACTORIES

Fire Clay Brick *Carloads per 1000*

First quality, Ill., Ky., Md., Mo., Ohio, Pa. (except Salina, Pa., add $5.00)	$109.00
No. 1 Ohio	102.00
Sec. quality, Pa., Md., Ky., Mo., Ill.	102.00
No. 2 Ohio	93.00
Ground fire clay, net ton, bulk (except Salina, Pa. add $1.50)	16.00

Silica Brick

Mt. Union, Pa., Ensley, Ala.	$115.00
Childs, Hays, Pa.	120.00
Chicago District	125.00
Western Utah	131.00
California	138.00
Super Duty Hays, Pa., Athens, Tex., Windham	132.00
Curtner, Calif.	150.00
Silica cement, net ton, bulk, Eastern (except Hays, Pa.)	19.00
Silica cement, net ton, bulk, Hays, Pa.	21.00
Silica cement, net ton, bulk, Chicago District, Ensley, Ala.	20.00
Silica cement, net ton, bulk, Utah and Calif.	28.50

Chrome Brick *Per net ton*

Standard chemically bonded Balt.	$86.00
Standard chemically bonded, Curtner, Calif.	96.25
Burned, Balt.	80.00

Magnesite Brick

Standard Baltimore	$109.00
Chemically bonded, Baltimore	97.50

Grain Magnesite *St. ⅝-in. grains*

Domestic, f.o.b. Baltimore in bulk fines removed	$64.40
Domestic, f.o.b. Chewalah, Wash., in bulk	38.00
in sacks	43.75

Dead Burned Dolomite *Per net ton*

F.o.b., bulk, producing points in: Pa., W. Va., Ohio	$14.50
Midwest	14.60
Missouri Valley	13.65

FLUORSPAR

Washed gravel, f.o.b. Rosiclaire, Ill. Price, net ton; Effective CaF_2 content

72½%	$44.00
70% or more	42.50
60% or less	38.00

METAL POWDERS

Per pound, f.o.b. shipping point, in ton lots, for minus 100 mesh.

Swedish sponge iron, c.i.f. New York, ocean bags	11.25¢
Canadian sponge iron, del's. in East	12.0¢
Domestic sponge iron, 98+% Fe, carload lots	18.0¢
Electrolytic iron, annealed, 99.5+% Fe	44.0¢
Electrolytic iron, unannealed, minus 325 mesh, 99+% Fe	60.0¢
Hydrogen reduced iron minus 300 mesh, 98+% Fe	63.0¢ to 80.0¢
Carbonyl iron, size 5 to 10 mieron, 98%, 99.8+% Fe	83.0¢ to $1.48
Aluminum	31.5¢
Brass, 10 ton lots	29.50¢ to 36.50¢
Copper, electrolytic	43.50¢
Copper, reduced	43.50¢
Cadmium, 100-199 lb 95¢ plus metal value	
Chromium, electrolytic, 99% min., and quality, del'd	$3.60
Lead	21.75¢
Manganese	57.0¢
Molybdenum, 99%	$2.75
Nickel, unannealed	89.50¢
Nickel, annealed	96.50¢
Nickel, spherical, unannealed	93.50¢
Silicon	43.50¢
Solder powder 7.0¢ to 9.0¢ plus met. value	
Stainless steel, 302	91.0¢
Stainless steel, 316	$1.10
Tin	14.04¢ plus metal value
Tungsten, 99% (65 mesh)	$5.35
Zinc, 10 ton lots	17.5¢ to 25.0¢

Ferroalloy Prices

(Effective Feb. 16, 1954)

Ferrochrome

Contract prices, cents per lb contained Cr, lump size, bulk, in carloads, delivered.

65-72 Cr, 2% max. Si.

0.025% C	34.50	0.20% C	33.50
0.06% C	34.50	0.50% C	33.25
0.10% C	34.00	1.00% C	33.00
0.15% C	33.75	2.00% C	32.75

65-69% Cr, 4.9% C 24.75
62-66% Cr, 4.6% C, 6-9% Si 25.60

S. M. Ferrochrome

Contract price, cents per pound, chromium contained, lump size, delivered.

High carbon type: 60.65% Cr, 4-6% Si, 4-6% Mn, 4-6% C.

Carloads 25.85
Ton lots 28.00
Less ton lots 29.50

High-Nitrogen Ferrochrome

Low-carbon type 67-72% Cr, 0.75% N. Add 5¢ per lb to regular low carbon ferrochrome price schedule. Add 3¢ for each additional 0.25% of N.

Chromium Metal

Contract prices, per lb chromium contained, packed, delivered, ton lots, 97% min. Cr, 1% max. Fe.

0.10% max. C $1.18
0.50% max. C 1.14
9 to 11% C 1.11

Low Carbon Ferrochrome Silicon

(Cr 34-41%, Si 42-49%, C 0.05% max.) Contract price, carloads, f.o.b. Niagara Falls, freight allowed, lump 4-in. x down, bulk 2-in. x down, 24.75¢ per lb of contained Cr plus 12.40¢ per lb of contained Si.

Bulk 1-in. x down, 24.90¢ per lb contained Cr plus 12.69¢ per lb contained Si.

Calcium-Silicon

Contract price per lb of alloy, lump delivered.

30-33% Cr, 60-65% Si, 3.00% max. Fe.

Carloads 19.00
Ton lots 22.10
Less ton lots 23.60

Calcium-Manganese—Silicon

Contract prices, cents per lb of alloy lump, delivered.

16-20% Ca, 14-18% Mn, 53-59% Si.

Carloads 20.00
Ton lots 22.30
Less ton lots 23.30

5MZ

Contract price, cents per pound of alloy, delivered, 60-65% Si, 5-7% Mn, 5-7% Zr, 20% Fe ½ in. x 12 mesh.

Ton lots 17.50
Less ton lots 19.50

V Foundry Alloy

Cents per pound of alloy, f.o.b. Suspension Bridge, N. Y., freight allowed, max. St. Louis, V-5; 38-42% Cr, 17-19% Si, 8-11% Mn.

Ton lots 16.50
Less ton lots 17.75

Graphidox No. 4

Cents per pound of alloy, f.o.b. Suspension Bridge, N. Y., freight allowed, max. St. Louis, Si 48 to 52%, Ti 9 to 11%, Ca 5 to 7%.

Carload packed 17.50
Ton lots to carload packed 18.50
Less ton lots 20.00

Ferromanganese

Maximum contract base price, f.o.b., lump size, base content 74 to 75 pct Mn;

Producing Point	Cents per-lb
Marietta, Ashtabula, O.; Alloy, W. Va.; Sheffield, Ala.; Portland Ore.	10.00
Clairton, Pa.	10.00
Sheridan, Pa.	10.00

Add or subtract 0.1¢ for each 1 pct Mn above or below base content.

Briquets, delivered, 66 pct Mn:

Carloads, bulk 12.50
Ton lots, packed 14.05

Spiegeleisen

Contract prices, per gross ton, lump, f.o.b. Palmerton, Pa.

Manganese	Silicon	
16 to 19%	3% max.	$84.00
19 to 21%	3% max.	86.00
21 to 23%	3% max.	88.50
23 to 25%	3% max.	91.00

Manganese Metal

Contract basis, 2 in. x down, cents per pound of metal, delivered.

95.50% min. Mn, 0.2% max. C, 1% max. Si, 2.5% max. Fe.

Carload, packed 36.95
Ton lots 38.45

Electrolytic Manganese

F.o.b. Knoxville, Tenn., freight allowed east of Mississippi, cents per pound.

Carloads 31.50
Ton lots 33.50
Less ton lots 35.50
Premium for hydrogen-removed metal 1.50

Medium Carbon Ferromanganese

Mn 80% to 85%, C 1.25 to 1.50. Contract price, carloads, lump, bulk, delivered, per lb of contained Mn ..... 21.35¢

Low-Carb Ferromanganese

Contract price, cents per pound Mn contained, lump size, del'd Mn 85-90%.

	Carloads	Ton	Less
0.07% max. C, 0.06% P, 90% Mn	30.00	31.85	33.05
0.07% max. C	27.95	29.80	31.00
0.15% max. C	27.45	29.30	30.50
0.30% max. C	26.95	28.80	30.00
0.50% max. C	26.45	28.30	29.50
0.75% max. C, 80-85% Mn, 5.0-7.0% Si	23.45	25.30	26.50

Silicomanganese

Contract basis, lump size, cents per pound of metal, delivered, 65-68% Mn, 18-20% Si, 1.5% max. C for 2% max. C, deduct 0.2¢.

Carload bulk 11.40
Ton lots 13.05
Briquet contract basis carlots, bulk delivered, per lb of briquet 12.65
Ton lots, packed 14.25

Silvery Iron (electric furnace)

Si 14.01 to 14.50 pct, f.o.b. Keokuk, Iowa, or Wenatchee, Wash., $92.00 gross ton, freight allowed to normal trade area. Si 15.01 to 15.50 pct, f.o.b. Niagara Falls, N. Y., $89.50. Add $1.00 per ton for each additional 0.50% Si up to and including 17%. Add $1.45 for each 0.50% Mn over 1%.

Silicon Metal

Contract price, cents per pound contained Si, lump size, delivered, packed.

	Ton Lots	Carloads
96% Si, 2% Fe	20.10	18.00
97% Si, 1% Fe	20.60	18.50

Silicon Briquets

Contract price, cents per pound of briquet bulk, delivered, 40% Si, 2 lb Si briquets.

Carloads, bulk 6.95
Ton lots 8.55

Electric Ferrosilicon

Contract price, cents per lb contained Si, lump, bulk, carloads, delivered.

25% Si	20.00	75% Si	14.30
50% Si	12.40	85% Si	15.55
65% Si	13.60	90.95% Si	17.00

Calcium Metal

Eastern zone contract prices, cents per pound of metal, delivered.

	Cast	Turnings	Distilled
Ton lots	$2.05	$2.95	$3.75
Less ton lots	2.40	3.30	4.55

Ferrovanadium

35-55% contract, basis, delivered, per pound, contained V.

Openhearth ..... $3.00-$3.10
Crucible 3.10- 3.20
High speed steel (Primos) 3.20- 3.25

Alsifer, 20% Al, 40% Si, 40% Fe, contract basis f.o.b. Suspension Bridge, N. Y.

Carloads 9.90
Ton lots 11.30

Calcium molybdate, 47.5-46.6% f.o.b. Langeloth, Pa., per pound contained Mo. $1.15

Ferrocolumbium, 50-60% 2 in. x D contract basis, delivered per pound contained Cb.

Ton lots $6.40
Less ton lots 6.45

Ferro-Tantalum-Columbium, 20% Ta, 40% Cb, 0.30% C. Contract basis, delivered, ton lots, 2 in. x D, per lb of contained Cb plus Ta $4.75

Ferromolybdenum, 55-75%, f.o.b. Langeloth, Pa., per pound contained Mo. $1.32

Ferrophosphorus, electric, 23-26%, car lots, f.o.b. Siglo, Mt. Pleasant, Tenn., $4.00 unitage, per gross ton $90.00
10 tons to less carload $110.00

Ferrotitanium, 40% regular grade, 0.10% C max., f.o.b. Niagara Falls, N. Y., and Bridgeville, Pa., freight allowed, ton lots, per lb contained Ti $1.35

Ferrotitanium, 25% low carbon, 0.10% C max., f.o.b. Niagara Falls, N. Y., and Bridgeville, Pa., freight allowed, ton lots, per lb contained Ti $1.50
Less ton lots 1.55

Ferrotitanium, 15 to 18% high carbon, f.o.b. Niagara Falls, N. Y., freight allowed, carload, per net ton $177.00

Ferrotungsten, ¼ x down, packed, per pound contained W, ton lots, f.o.b. $3.90

Molybdic oxide, briquets or cans, per lb contained Mo, f.o.b. Langeloth, Pa. $1.14
bags, f.o.b. Washington, Pa., Langeloth, Pa. $1.13

Simanal, 20% Si, 20% Mn, 20% Al, contract basis, f.o.b. Philo, Ohio, freight allowed, per pound

Carload, bulk lump ..... 14.50¢
Ton lots, bulk lump ..... 15.75¢
Less ton lots, lump ..... 16.25¢

Vanadium Pentoxide, 86-89% V_2O_5 contract basis, per pound contained V_2O_5 ..... $1.31

Zirconium, 35-40%, contract basis, f.o.b. plant, freight allowed, per pound of alloy.

Ton lots ..... 21.00¢

Zirconium, 12-15%, contract basis, lump, delivered, per lb of alloy.

Carload, bulk ..... 8.00¢

Boron Agents

Borosil, contract prices per lb of alloy del. f.o.b. Philo, Ohio, freight allowed, B, 3-4%, Si, 40-45%, per lb contained B. $5.35

Bortam, f.o.b. Niagara Falls

Ton lots, per pound ..... 45¢
Less ton lots, per pound ..... 50¢

Corbortam, Ti 15-21%, B, 1-2%, Si, 2-4%, Al, 1-2%, C, 4.5-7.5% f.o.b. Suspension Bridge, N. Y., freight allowed.

Ton lots per pound ..... 19.00¢

Ferroboron, 17.50% min. B, 1.50% max. Si, 0.50% max. Al, 0.50% max. C, 1 in. x D, Ton lots $1.30
F.o.b. Wash., Pa.; 100 lb up

10 to 14% B ..... $1.
14 to 19% B 1.20
19% min. B 1.50

Grainal, f.o.b. Bridgeville, Pa., freight allowed, 100 lb and over

No. 1 ..... $1.00
No. 6 ..... 65¢
No. 79 ..... 50¢

Manganese-Boron, 75.00% Mn, 15-20% B, 5% max. Fe, 1.50% max. Si, 3.00% max. C, 2 in. x D, del'd

Ton lots $1.45
Less ton lots 1.57

Nickel-Boron, 15-18% B, 1.00% max. Al, 1.50% max. Si, 0.50% Max C, 3.00% max. Fe, balance Ni, delivered

Less ton lots $2.05

Silcaz, contract basis, delivered

Ton lots ..... 45.00¢